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EFFECT OF SPLIT APPLICATION OF FERTILIZER ON YIELD, COMPONENTS OF YIELD, AND OTHER AGRONOMIC CHARACTERS OF RICE (V)*

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Experiments conducted at the Chiayi Agricultural Experiment Station in the past years have consistently indicated that application of nitrogen fertilizer was definitly effective in increasing grain yield of rice (Chang and Yang, 1964 a, 1964 b, 1966; Chang *et al.*, 1967). However, the effect of split application of potassium fertilizer was rather unstable. In the experiments conducted at Wan-tien-li Farm of this Station, it was found to be generally effective (Chang and Yang, 1964 a, 1964 b, 1966), but in the experiments of Tai-tou-ken Farm, there was no evidence of the effectiveness of split application of potassium fertilizer (Chang *et al.*, 1967). Split application of phosphorus fertilizer also failed to show any significant improvement in the production of rice (Chang and Yang, 1964 b).

An island wide experiment on the effect of split application of fertilizers which was sponsored by the Joint Commission on Rural Reconstruction and conducted by all the 7 District Agricultural Improvement Stations in 1965 and 1966 generally gave the similar results as those already obtained by this Station. However, before recommending this new technique of fertilizer application to farmers, more information concerning this method is still needed. Therefore, a follow-up coordinated experiment was started in 1967 to investigate the effectiveness of applying various rates of nitrogen fertilizer at the maximum tillering, the panicle formation, and the heading stages of rice development. This paper presents a brief summary of the experimental results obtained at this Station.

MATERIALS AND METHODS

Ammonium sulfate was used as source of nitrogen which was applied to rice in different combinations at various stages of growth as listed in Table 1. Calcium superphosphate and Potassium chloride were used as sources of P_2O_5 and K_2O which were applied at the rate of 60 kg per ha. The whole amount of P_2O_5 and half of K_2O were used as basal dressing and the other half of K_2O was applied at the time of second top dressing.

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Table 1. Treatments of nitrogen application* (Unit : kg/ha)

Treatment	Basic dressing	First top-dressing	Secon top-dressing	Third top-dressing or panicle fertilization	Fourth top-dressing or grain fertilization	Total
A	30	20	25	—	—	75
B	30	20	25	25	—	100
C	30	20	50	—	—	100
D	30	20	25	25	10	110
E	30	20	35	25	—	110
F	30	20	25	35	—	110

* Basic dressing: One day before transplanting.

First top-dressing: 30 days (1st crop) and 16 days (2nd crop) after transplanting.

Third top-dressing or panicle fetilization: Panicle formation stage or 60 days (1st crop) and 40 days (2nd crop) after transplanting.

Fourth top-dressing or grain fertilization: Heading stage or 82 days (1st crop) and 60 days (2nd crop) after transplanting.

The experiment was conducted at Tai-tou-ken Farm of the Chiayi Agricultural Experiment Station in both crops of 1967. The nature of the soil of the experimental plot was similar to that of the previous experiment (Chang *et al.*, 1967). Chianung 242, a typical panicle weight type of Japonica rice variety was used in the test. The plant spacing was 22.5 by 22.5 cm with 5 seedlings being transplanted at each hill. Climatic conditions were favorable for good rice growth during the test period.

The design of the experiment was a randomized complete block with 4 replications. Each plot consisted of 13 rows of 20 hills each from which 11 rows of 18 hills each or an area of 2.5 by 4m ($10m^2$ or 1/1,000 ha) was harvested for yield determination. Besides grain yield, data for heading date, maturity date, plant height, number of panicles per hill, panicle weight, panicle length, weight of 1,000 grains, and number of grains per panicle were also taken for the analysis of variance.

RESULTS AND DISCUSSION

Effect of Time of Nitrogen Application on Grain Yield and Its Components.

The average yield, components of yield, and F values for each treatment are given in Table 2. In the first crop, rice yield was generally in parallel with total amount of nitrogen applied, the higher the rate of nitrogen, the higher the yield. However, in the second crop, the relationship between grain yield and nitrogen rate was rather irregular, the higher rate of nitrogen did not necessarily resulted in a higher yield, indicating that the influence of rate of nitrogen on grain yield was not so pronunced in the second crop as it was in the first one.

Table 2. Effect of time of nitrogen fertilization on grain yield and its components of rice.

Treatment	Grain yield (kg/ha)		Number of panicles per hill		Number of grains per panicle		Weight of 1,000 grains (g)	
	1st crop, 1967	2nd crop, 1967	1st crop, 1967	2nd crop, 1967	1st crop, 1967	2nd crop, 1967	1st crop, 1967	2nd crop, 1967
A	5,964	4,854	13.3	8.8	118.5	150.6	29.5	29.0
B	6,131	5,326	12.1	9.4	128.4	157.4	29.8	30.5
C	6,231	4,870	13.2	10.1	128.5	141.1	29.0	29.0
D	6,268	5,256	13.1	8.8	128.6	151.4	29.8	29.3
E	6,270	5,537	13.1	9.4	126.6	159.9	29.8	29.5
F	6,585	5,020	13.0	9.6	144.5	144.7	30.3	29.5
Mean	6,242	5,144	13.0	9.4	129.2	150.9	29.7	29.5
F value	2.28	1.51	0.60	1.22	3.62	3.40	0.35	0.35
LSD 5%	—	—	—	—	13.31	11.7	—	—
LSD 1%	—	—	—	—	—	—	—	—

Treatment B yielded 100 kg or 2% lower per ha than treatment C in the first crop, showing that the same amount of nitrogen divided equally at both the maximum tillering and the panicle formation stages did not give better result than that top-dressed at the maximum tillering stage alone. However, treatment B outyielded treatment C by 456 kg or 9% per ha in the second crop, showing that additional top-dressing of nitrogen at the panicle formation stage was highly effective in raising yielding ability of rice in the second crop. This observation well agreed with those of the previous experiments conducted by this Station (Chang and Yang, 1966; Chang *et al.*, 1967), and that of Moomaw (1965). It appears, therefore, that panicle fertilization may not be a necessary factor for a high yield production in the first crop provided that sufficient amount of nitrogen is made available at the time of transplanting and at the maximum tillering stage, whereas in the second crop, panicle fertilization is undoubtly a prerequisite factor to a high yield, no matter now much nitrogen is applied as basal and top-dressings.

Treatment D top-dressed nitrogen at the heading stage in both crops. Since grain yields of this treatment were lower than those of treatment E which did not use grain fertilization in both crops, it seems likely that nitrogen application at heading stage may be unnecessary as long as sufficient nitrogen is applied before. The result of this experiment was generally similar to that of the previous one (Chang *et al.*, 1967). It appears probable that nitrogen application at heading stage or panicle fertilization may be effective only under certain fertilization system as suggested by Matsushima and Tanaka (1967). Treatments D, E, and F differed only in additional 10 kg of nitrogen per ha applied at heading, maximum tillering, and panicle formation stages, respectively. The differences in yields among these three treatments were not significant statistically, indi-

cating that changes of this portion of nitrogen did not affect yield greatly.

From the data of yield components, it was found that number of panicles per hill was not affected by the treatment. Treatments with higher grain yield were generally associated with more grains par panicle and larger 1,000-grain weight, showing that the increase in grain yield was caused largely by these two components. The result of this experiment was similar to that of Chang and Yang (1966) but differed with that of Chang *et al.* (1967).

Effect of Time of Nitrogen Application on Some Agronomic Traits of Rice.

A summary of the data and F values of some important agronomic traits are presented in Table 3. Heading date was not affected by the treatment in both crops, however, the maturity date of treatment D which applied nitrogen at heading stage, was longer than the other treatments especially in the second crop, indicating that nitrogen application at heading stage delayed maturity of rice. The difference in maturity date among treatments was significant at 1% level in the second crop. Plant height was generally associated with grain yield, the taller the plant, the higher the grain yield. Differences in plant height among treatments were highly significant in both crops. Since plant height is negatively correlated with lodging resistance factor (Chang, 1967), attention sould therefore be paid on the time of panicle fertilization to prevent excessive elongation of rice plant. Treatments applied nitrogen at panicle formation stage generally produced larger and heavier panicles than those without panicle fertilization, differences being statistically significant except that of panicle weight in the first crop.

Table 3. Effect of time of nitrogen fertilization on some agronomic traits of rice.

Treatment	Heading date (days)		Maturity date (days)		Plant height (cm)		Panicle length (cm)		Panicle weight (g)	
	1st crop, 1967	2nd crop, 1967	1st crop, 1967	2nd crop, 1967	1st crop, 1967	2nd crop. 1967	1st crop, 1967	2nd crop, 1967	1st crop, 1967	2nd crop, 1967
A	83	59	113	95	107.1	114.6	22.6	24.6	3.5	4.3
B	83	60	113	96	112.0	117.7	23.6	25.5	3.7	4.5
C	82	60	113	95	112.2	117.1	22.9	23.6	3.7	3.9
D	83	60	114	98	111.5	117.1	23.9	25.6	3.7	4.4
E	82	60	112	96	112.1	120.2	24.1	25.6	3.6	4.3
F	82	60	113	97	113.8	119.2	24.8	25.5	4.0	4.3
Mean	83	60	113	96	111.5	117.7	23.7	25.1	3.7	4.4
F value	0.32	0.41	2.21	9.33	7.88	8.77	5.93	8.03	2.75	3.67
LSD 5%	—	—	—	1.07	2.45	1.94	1.02	0.88	—	0.29
LSD 1%	—	—	—	1.48	3.38	2.68	1.41	1.21	—	—

SUMMARY

The effect of time of nitrogen application on grain yield, its components, and some agronomic traits of rice evaluated in both crops of 1967 at the Chiayi Agricultural Experiment Station are reported.

The application of nitrogen at panicle formation stage did not make itself felt in the first crop, however, it was highly effective in the second crop. The increase of yield appeared to be due largely to the increase in number of grains per panicle and weight of 1,000 grains. Top-dressing of nitrogen at heading stage did not contribute to the increase of grain yield.

Time of nitrogen application did not affect heading date, but maturity date was significantly delayed by application of nitrogen at heading stage. The nitrogen application at panicle formation stage generally produced larger and heavier panicles. There was also an indication for a tall plant to be associated with a high yielding ability.

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肥料分施對水稻產量、產量構成因素、及其他農藝性狀之效果（五）

張　萬　來

摘　要

本文係報告嘉義農業試驗分所於民國56年承辦全省性水稻肥料分施試驗所得之結果。

在幼穗形成期施用氮肥之效果，對第一期作水稻產量之影響不大，但對第二期作水稻却有明顯之增產效果，其增產原因爲每穗粒數與千粒重之增加，在抽穗期施用氮肥未見成效。

氮肥分施不影響生育日數，但抽穗期施用氮肥可延遲水稻之成熟期。幼穗形成期施用氮肥，有利於株高，穗長及穗重之發育。

Dapog 秧苗生產力之初步觀察

張　萬　來

前　言

本省水稻第一期作收穫至第二期作挿秧間隔甚短，工作繁忙，因此常因勞力不够分配致延誤第二期作水稻之挿秧工作。農民有時為爭取時效，不得不以高價僱工，因此水稻生產成本普遍提高而其純收益則比例減少。本省工業正在擴大發展中，農村勞力勢必逐漸轉移為工業勞力，將來在第一期作收刈至第二期作挿秧之這一段農忙期間，勞力缺乏之情形將更加嚴重。是故，今後本省之稻作栽培應在不影響其單位面積生產量之原則下，極力走向省力栽培，才不致被時代所遺棄。嘉義農業試驗分所有鑒於此，曾設置簡便而省力之 Dapog 秧田並觀察其秧苗移植本田後之生產力，以檢討該秧田是否值得在本省推廣。按 Dapog 秧田為菲律賓呂宋島南部與 Bicol 地區頗為盛行之一種秧田，其優點有：⑴育苗期間短，平均在播種後 8 至14日即可供挿秧。⑵不需拔秧，故不僅可節省拔秧勞力又可避免因拔苗時幼根之損傷。⑶可減少秧田面積，平均每公頃本田所需秧田面積僅為12～15坪。⑷生產力高（UPCA, 1967）。玆將本分所在56年年二期作初步試驗結果報告於後，以供參考。

試驗材料與方法

本試驗於民國56年第二期作在嘉義農業試驗分所山子頂試驗田舉行，設置 Dapog 秧田並以本省標準改良秧田為對照。改良秧田之設置以「蓬萊稻栽培法」小册（洪與張，1965）所述方法實施。Dapog 秧田則參考「水稻生產手册」（UPCA, 1967）介紹之方法行之，即：將改良秧田之秧床壓平後舖上一層塑膠布，然後將浸種24小時後之稻種厚播在塑膠布上。播種後3～4日內，每日上、下午各澆水一次並以手或木板緊壓稻種。4天後秧田經常保持1～2公分之淺水，並使灌漑水時常流動，以供應充足之氧氣。

本試驗供試品種為嘉農242號，播種量為改良秧田每坪4 合（約400克），Dapog 秧田為每坪4升（約4,000克）。播種日期為56年 7 月 5 日，挿秧日期為 7 月23日，秧田日數18日。改良秧田之採苗方式為拔秧，而 Dapog 秧田則將秧帶以手輕輕拉開成適當大小之秧片即可供挿秧。田間試驗設兩處理即 Dapog 與改良秧田秧苗（對照），試驗採用隨機區組設計，重複4次，每小區大小為4×2.5公尺，合10平方公尺。行距25公分，株距 16 公分。氮、磷、鉀，三要素之施肥量為每公頃100，50，50公斤。試驗田之肥培管理均依本分所標準法實施。

試驗結果與討論

1. 秧田期間秧苗之發育情形：

Dapog秧田在播種後之發芽較播在土面之改良秧田為慢。根據「水稻生產手册」（UPCA, 1967）之記載，Dapog 秧田均使用已萌芽之稻種。本試驗僅使用浸種 24 小時之稻種，這可能是 Dapog 秧田發芽較遲之原因，今後似應注意改善。又 Dapog 秧田因極為密播（約為改良秧田之10倍），個體間對空間及陽光等之競爭乃甚强烈，故其秧苗一般言之，均較改良秧田者細小。由於Dapog 秧苗之幼根與秧床之土壤隔有一層塑膠布，土壤中之養分自無法被吸收利用，其生長發育須完全依靠種子本身胚乳內含有養分之供給。 Dapog 秧田應實施嚴格稻種

精選，自不待言。

本試驗 Dapog 秧苗之葉色較改良秧田者爲淡，相差頗爲顯明。雖然水稻種子自萌芽後至伸出第 3 本葉期間，不需土壤養分之供應（Matsubayashi *et al.*, 1963），但由本試驗可以看出土壤中之養分亦有助於初期秧苗之發育。Dapog 秧田是否應加以施肥，似值得檢討。

挿秧直前曾調查兩種秧苗之有關性狀(表一)。由表一可知秧田日數雖同爲18日，但Dapog 秧苗顯較改良秧田者爲小。這可能與其密播者有關。 Dapog 秧苗之根長顯較改良秧田者爲長，根數亦多。改良秧田育成之秧苗因拔秧時常有斷根致其根長，根數均小。Dapog秧苗因不需拔秧故幼根既不損傷，又可節省勞力及一筆可觀的採苗費。據估計每公頃本田約需 3 至 4 工拔苗，佔挿秧工數三分之一。若每工以新臺幣60元計算，則每公頃可節省200 元左右之採苗費。這似爲 Dapog 秧田對本省第二期作水稻最具吸引力之一點。

表一 挿秧時之 Dapog 及改良秧田秧苗調查結果

秧田類別	秧田日數(日)	苗高(公分)	葉數	根長(公分)	根數
Dapog	18	9.98	3.4	9.71	9.50
改良秧田(ck)	18	17.63	4.1	2.81	6.90

本試驗供挿秧之 Dapog 秧苗，其秧田日數爲18日。此時部分灌溉水流通不佳之處，已發現有根腐之現象。由此可知 Dapog 秧田之灌漑問題須特別留意之外，應酌量縮短秧田日數提早移植。Dapog 秧苗在非律賓之秧田日數爲 8 ～14日（UPCA, 1967）。

2. 秧田移植本田後之表現：

Dapog 秧苗經手拉成適當大小之秧片後，在挿秧時並不影響其速度，亦無不便之處，惟 Dapog 秧苗因較細小，故挿秧時每株支數較易增加，須注意避免 。秧苗移植本田之發育及其生產力之表現如表二。Dapog 秧苗在移植後40日之株高顯較改良秧田者爲小，這似爲 Dapog 秧苗較爲細小之後作用，惟此後作用在發育中，後期即見消失 ，故成熟期之株高 ，兩者相等。就每株分蘖而言，Dapog 秧苗與改良秧田者亦無甚差異 ， 但是前者在成熟期之穗數似有較後者爲多之趨勢。Dapog秧苗之生育日數長於改良秧田者，其差異極爲顯著，這可能是挿秧時Dapog秧苗之葉數較改良秧田者爲少（少0.7葉）之故。Dapog 秧苗處理之每公頃乾淨谷產量高達4,712公斤較對照處理改良秧田之 4,555 公斤高出157公斤 ，增產3.4% 。雖然兩者在產量之差異未達顯著水準 ，Dapog 秧苗之生產力不亞於本省推廣中之改良秧田者， 由此可得證明 。Dapog秧苗較改良秧田秧苗增產之原因似爲前者在採苗時不受損傷所致 。 Dapog 秧田若再加以試驗改良之後，或許可以在本省若干地區第二期作採用，尤其利用爲早熟稻品種之秧田將更理想，因縮短早熟稻品種之秧田日數可提高其單位面積產量（趙等，1967）。

表二 Dapog 及改良秧田秧苗在本田之表現

秧田類別	移植後40日		成熟期		生育日數(日)	乾淨谷產量 公斤/公頃	百分比(%)
	株高(公分)	每株分蘖(支)	株高(公分)	每株穗數(支)			
Dapog	82.6	11.6	124.1	10.3	66	4,712	103.4
改良秧田(ck)	87.2	11.8	124.0	9.7	64	4,555	100.0

摘　　要

嘉義農業試驗分所爲明瞭 Dapog 秧田在本省推廣之可能性，於民國56年第二期作設置該秧田育苗，觀察其在秧田及本田之表現並與本省推廣之標準改良秧田（對照）比較。本試驗初步結果顯示 Dapog 秧苗之苗高，每苗葉數均較改良秧田者爲小，但是其每苗根長，根數却大於改良秧田。在本田發育初期，Dapog 區之株高，每株分蘗均小於對照區，惟在成熟期，兩處理之株高，每株穗數相若而 Dapog 秧田區之每株穗數稍高於對照區。 Dapog 區之生育日數長於對照區，相差極爲顯著。就每公頃乾淨谷之產量而言，Dapog 區高達4,712公斤，較對照區增產 3.4%。由於Dapog 秧田可節省勞力，又可縮短秧田日數，其秧苗生產力亦不亞於本省之改良秧田育成之秧苗，故若經試驗改良後，在本省第二期作似有採用之價值。

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PRELIMINARY OBSERVATION ON THE PERFORMANCE OF "DAPOG" SEEDLINGS

W. L. Chang

SUMMARY

"Dapog" seedbed extensively practiced in Southern Luzon and the Bicol regions of the Philippines was tried in the second crop of 1967 at the Chiayi Agricultural Experiment Station, and the performance of its seedlings was compared with those of the standard "Improved" nursery or semi-irrigated nursery commonly practiced in Taiwan n both the nursery and the paddy field. The preliminary observation showed that "Dapog" seedlings were smaller and younger than those of the "Improved" nursery at the time of transplanting. The length and the number of root of each "Dapog" seedling were, however, larger than those of the check.

The plant height and the number of tillers per hill at 40 days after transplanting were. smaller in the plots of "Dapog" seedlings, but they were larger at maturing stage Heading date of "Dapog" treatment was significantly later than that of the check. Grain yield of "Dapog" seedings reached 4,712 kg per ha which was 157 kg or 3.4% hgiher than that of the "Improved" nursery. Since the "Dapog" seedbed can save much labors and reduce stem or root injury in the pulling of seedlings, it appears highly likely that this method can be accepted in the second crop in some part of Taiwan.

利用雜交優勢之苧麻育種研究（初報）

邱 裕 鴻

一、緒　言

苧麻爲我國古老且爲植物纖維中，最强韌而細美的纖維作物之一。主要用途爲織成夏布、蚊帳、帆布及繩索等，用途頗廣。近年來用於與化學纖維之混織（Tetoron 65% Ramie 35%）織成爲夏季衣料，頗得一般士紳的好評。由其栽培經營來說，向來是沿用無性繁殖方法，對於品種之更新，迄今尚無適當之育種方法。在日本多年以前曾應用天然結實種子，繁殖實生苗選擇理想個體，再用無性繁殖法予以增殖，進行比較試驗，最後決定優劣，待品種育成後仍以無性繁殖法繼續保存，由此法所育成之品種如宮崎 112 號就是一個例子。此種方法是簡而易行，適合於初期品種改良應用，但採用此法，因材料之來源固定，選擇範圍有限，其能獲得較爲理想形質，殊爲不易，每每所選品種，在某一方面具有優越性能，但在另一方面却有嚴重的缺憾存在，以影響整個品種之評價，如前所提及之宮崎 112 號，係分蘗旺盛，產量高，但極易倒伏之品種，而使收量減低，此爲一良好例證。故欲獲得更爲理想之品種，使用雜交方法聯合雙親優點於下一代似爲妥善方法之一。

本試驗首先以自交方法，育成自交系，利用適當優良自交系進行品系間雜交，產生一代雜種，再經過各級試驗育成優良雜種（該項初步試驗尚在進行中，試驗成績容後續報）。本文主要爲辦理品系與品種間雜交，於 F_1 時選拔理想單株，繼用無性繁殖法通過各級試驗決定優良品種。

茲將該試驗之經過述之於後以作苧麻育種上之參考。此項試驗僅爲苧麻雜交育種試驗之一部份，整個試驗原由張拔倫先生主持，筆者則參加工作，後張拔倫先生離所，部份工作由筆者繼續辦理。

二、材料及方法

A. 材料：供試驗之苧麻品種有宮崎112號，細莖青心、南化青皮、青心大冇，自交系 86. TP 64(1—1)—3—3—11、113. TP 64(3—1)—1—2—3, 117. TP 54(3—1)—5—1—3、174. TP (3—SP.23)—1，等 4 個自交系。

親本品種及自交系之特性

品種名稱或自交系	株高	分蘗	葉形	托及葉豚色	其他
南化青皮	高	多	大型	綠	豐產，爲本省南部之栽培品種，
細莖青心	高	多	大型	綠	纖維品質中等，收量多。
宮崎 112 號	高	多	中型	綠	纖維品質中等，但易倒伏。
86. TP 64(1—1)—3—3—11	高	多	大型	綠	
113. TP 64(3—1)—1—2—3	中等	多	中型 微紅	綠	
117. TP 54(3—1)—5—1—3	中等	多	大型 濃綠	綠	
174. TP 57(3—SP.23)—1	高	特別多	中型	綠	

(1) 1960年自交統一行號。

(2) TP 54 爲在臺北1954年，TP 57 即爲臺北1957年開始，(1—1)爲頭一個 1 係品種代號即爲宮崎 112 號，3 爲青心大冇，後面的 1 爲從天然雜交結實種子之第一代中，所選出的第 1 株。
3—3—11：頭一個 3 爲1955年從第一次自交後代中所選出之第 3 株，其後面之 3 爲1956年，從第二次自交後代所選出之第 3 株，最末之11爲第 3 次自交後代之第11株。

(3) 此爲1954年 5 月從青心大冇第一代天然雜交後代中所選出而特別優良之第23株。

B. 方法：

（1）自交及雜交時期爲9月間，自交時視植株雌花及雄蕾生長達到將要開花以前，選擇理想植株或後代予以套袋自交。另外待開花期從同一株所分蘖的枝條中，剪取正在盛花之雄穗（約30～40公分），插入事先裝置於套袋枝條上之小瓶中（瓶裡裝滿水綁緊在袋外下面），以促進授精結實。

雜交的方法，即於除去雄蕾之後立即套袋以免自交及與他品種之雜交。而於進行雜交以前，需打開布袋1～2次注意檢查雄蕾是否完全除去，必待雌花已相當發育時就可雜交，其步驟與自交方法相似，只是以選取之父本雄穗取代自交時之同株雄穗，如此便可雜交結實。約經3個月，種子逐次成熟後即可採種。採收的種子待至翌年3月下旬至4月上旬進行播種育苗，播種後以及在生育初期，爲避免雨水沖打，苗床需搭起竹架蓋上竹簾，以保護幼苗。在苗期需有2至4次的間拔，最後保持10公分×10公分之間隔。至6月上旬植株高達20公分時就可移田間定植，再行自交或雜交。如係育成自交系，則年年循環此操作一直到接近純化程度爲止。

（2）品系與品種間雜交後代單株選拔：利用南化青皮、宮崎112號、細莖青心等3個品種及86*(1)(TP54(1—1)—3—3—11*(2)), 117. (TP54(3—1)—5—1—3);113.(TP54(3—1)—1—2—3), 174.(TP57(3—SP.23)*(3)—1) 等4個理想自交系進行雜交，其雜交組合如下：

雜交組合代號	雜交組合
TP 60C2	南化青皮×113.(TP54(3—1)—1—2—3)
TP 60C3	南化青皮×117.(TP54(3—1)—5—1—3)
TP 60C71	細莖青心×86.(TP54(1—1)—3—3—11)
TP 60C98	174.(TP57(3—SP.23)—1)×宮崎112號

因種苗不敷供正式設計之用，故只將單株順序栽培於田間，於適當時期收穫其鮮株，主製成纖維以供比較。

三、結果及討論

1. 民國52年從四個雜交組合及南化青皮、細莖青心、宮崎112號等3個親本之後代中，選拔理想單株52個，參加株行觀察試驗，本試驗於是年7月、10月及53年3月共收穫3次，比較其鮮株重、鮮莖重及乾纖維重之產量結果，3個親本之後代均未獲得入選，只有雜交後代選獲之20品系能升級爲品系觀察試驗。其各品系之鮮株、鮮莖及乾纖維之三次單株平均產量，依田間排列順序列爲下表：

行號	原來雜交組合及株號	單株平均 (g)			行號	原來雜交組合及株號	單株平均 (g)		
		鮮株重	鮮莖重	乾纖維重			鮮株重	鮮莖重	乾纖維重
1	TP 60C2—37	412.3	285.7	10.3	16	TP 60C71—3	722.7	530.0	24.0
2	TP 60C2—38	856.0	538.0	13.7	19	TP 60C98—84	522.0	344.0	15.8
4	TP 60C71—2	562.7	391.3	19.7	20	CK	446.3	267.0	10.5
5	CK(南化青皮)	546.3	334.0	12.1	21	TP 60C98—15	610.3	378.0	12.8
6	TP 60C71—34	730.3	576.3	13.7	23	TP 60C98—86	543.3	366.3	16.7
15	CK	479.0	287.0	11.5	25	CK	344.7	215.0	6.9

30	CK	590.1	350.3	12.5	49	TP 60C71—73	617.3	385.0	16.3
32	TP 60C3—25	761.0	501.0	11.9	50	CK	463.7	265.0	9.2
35	CK	497.7	323.3	10.5	51	TP 60C71—74	764.0	542.0	23.2
37	TP 60C3—54	568.3	393.3	16.6	54	TP 60C71—95	627.0	443.7	24.2
39	TP 60C71—9	656.3	458.0	20.8	55	CK	586.7	348.7	12.7
40	CK	544.3	321.7	10.7	56	TP 60C98—4	615.0	423.0	20.0
44	TP 60C71—57	529.0	354.0	16.7	60	CK	535.0	321.0	12.2
45	CK	477.0	277.3	9.9	61	TP 60C98—41	692.0	455.0	20.5
46	TP 60C71—65	463.3	338.0	17.6	65	CK	592.7	347.0	13.9
47	TP 60C71—69	738.0	541.0	26.7	67	TP 60C71—87	727.0	458.3	21.0

備註：(1) 根據種於最接近之對照種爲準而比較選拔。
(2) 上列之數字均爲三次收穫之平均數。
(3) 爲順序排列，無重複，每單株種 1 行對照種（南化青皮）以作對照。

53年就上表所列之20個品系及由臺南棉麻分所育種之17個品系，共計37個品系辦理品系觀察試驗。本試驗經於 7 月及10月分別收穫後，根據乾纖維產量之比較結果，淘汰 8 個品系，並淘汰由臺南棉麻分所所選出之17個品系後，共獲得12個較爲優良的品系，此入選之品系升爲初級品系比較試驗。

茲將入選品系之成績列爲下表：

雜交組合及株號	株高 (公分)	有效分蘗 (支)	產量 鮮株重 (公斤)	產量 鮮莖重 (公斤)	產量 乾纖維重 (公克)	採纖率 (%)	指數 (%)	備註
TP 60C3—54	152.9	13.0	25.7	14.8	430.0	2.92	120	(1)順序排列重複 2 次，小區面積爲3m×1.5m=4.5m²，每小區種植 3 行，每行種植10株。 (2)左列之成績除株高以外，其他之分蘗產量等均爲 2 個重複平均之兩次收穫的合計數。 (3)指數係乾纖維之指數，即對照種（南化青皮）作爲100%時，對於其他各品系之比率。
TP 60C71—3	139.5	17.0	33.2	20.2	655.0	3.25	183	
C71—9	149.3	16.0	22.0	13.1	321.5	2.46	90	
C71—69	155.0	14.0	31.0	19.5	770.0	3.95	215	
C71—73	149.0	14.0	29.2	17.8	560.0	3.15	156	
C71—74	156.0	12.0	33.8	22.5	572.5	2.49	160	
C71—84	142.0	17.0	22.9	14.4	552.5	3.85	154	
C71—87	149.5	12.0	30.1	19.8	594.0	3.00	166	
C71—95	150.8	18.0	22.5	14.4	597.5	4.02	167	
TP 60C98—4	106.3	14.0	27.1	16.9	645.0	4.11	180	
C98—15	151.5	14.0	29.3	17.3	458.5	2.58	128	
C98—41	163.0	16.0	27.9	17.2	630.0	3.66	176	
CK_1(南化青皮)	128.5	14.0	21.8	10.8	382.5	3.56	100 (乾纖維平均產量爲358.3g)	
CK_2(南化青皮)	120.4	13.0	20.1	10.1	320.0	3.17		
CK_3(南化青皮)	134.5	16.0	21.6	11.6	372.5	3.25		

上表所列各組合後代之品系中，除 TP60C71—9 較差外，其他品系之各項表現均較對照種爲優。入選之12個品系中，TP60C71 組合即細莖青心×TP54(1—1)—3—3—11（宮崎112號之系統）

雜交後代佔有 8 個品系，證明該親本之結合後代甚爲優秀，母本之細莖青心爲日本之栽培品種，父本係宮崎 112 號之自交系，該品種在前面說過，除有倒伏缺點之外，是爲一個豐產品種。尤其 TP60C71—69 一品系表現尤佳，乾纖維收量指數爲215收量甚爲可觀。

以上入選之各品系，初步認爲無論親本甚至比目前之幾種推廣品種爲佳，同時得知從雜交第一代中，進行妥當的選拔，很可能選獲優良品系。此等材料於53年11月間進行升初級品系比較試驗時，因種植後遭遇乾旱以致影響缺株多，故於54年11月在原區重新種植，不料至55年 5 月下旬亦因日夜繼續大量降雨約半個月，以致整個試驗枯死達70%以上，因而試驗中斷。目前已將其等品系集中管理，一俟種苗足够時當行進一步之試驗。

四、摘　　要

（1）本試驗係佔苧麻雜交育種試驗之一部份，即爲品系與品種間雜交後代單株選拔過程之比較試驗。

（2）從四個雜交組合後代中，頭一年選拔52個單株（品系），第二年經過株行觀察試驗後選拔20個品系。於53年升爲品系觀察試驗後選得12個較佳品系，其中 TP60C71 組合後代佔有 8 個品系，證明該組合之親本含有甚爲優良的形質。至於各親本本身之天然雜交後代，表現均差而被淘汰。

（3）經品系觀察試驗結果，選獲之12個品系中，有 TP60C71—69 一品系之乾纖維收量指數，高達215%，較對照種之南化青皮收量增加115%。

（4）由於本試驗結果，略爲得知從苧麻雜交第一代中，爲經過妥當的選拔過程及技術上的操作，則可選得比親本甚至目前推廣品種爲優良的品系。

（5）在前面說過之12個品系，將升級進一步之試驗以後之試驗成績，容後續報。

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THE PRELIMINARY STUDY OF RAMIE BREEDING BY UTILIZING HYBRID VIGOR

by

Y. H. Chiu

SUMMARY

1. This report is the preliminary results of ramie breeding, for the comparison of yielding capacity of selected progenies from intercrosses between strains and varieties.

2. Among the progenies of four intercrosses, 52 lines were selected in the first year. Furthermore 20 lines out of 54 were selected after the plant-row observation test in the second year. After all, 12 lines were remained as the promising species. Among them, 8 species out of 12 lines were derivatives of TP 60C71 cross, indicating that the parents of this cross possessed good quality for breeding. However, none of the natural crossed progenies was among the 12 lines.

3. The highest yield of fiber dry weight was produced by TP 60C71—69, the index is 215% as compared to control variety.

4. Through a proper selection procedures, a line which possesses the higher yielding capacity than the original variety can be obrained.

5. The 12 selected lines will be undertaken for other studies.

柑桔珠心胚實生變異之研究

(第一報) 柑桔砧木品種胚數及胚色之調查

翁 仁 祿

一、前 言

將染色體構成維持爲2倍體之原狀而多型化之柑桔變異, 可謂全賴突然變異與 Gene recombination 爲其多型化主要因素。因此每品種必具極雜種性遺傳組成,又爲2倍性之故,突然變異之頻度該相當高。但柑桔體上所發生之變異往往呈 chimera 狀存在,生長點外層之 chimera 狀變異雖可由芽條變異查覺並繁殖,但內層持有之變異即無法由外觀發現。

柑桔類中甚多品種具多胚性,珠心胚實生係由多胚中之珠心細胞所發育,從單細胞而成之珠心胚實生不但有機會育成內藏之 chimera 狀變異之後代, 並可使無性繁殖多代之母體細胞組織還幼,增强樹勢,提高產量,提早熟期等。

柑桔砧木必需直傳母本形質,因此必選可育成珠心胚實生之多胚性品種。柑桔品種之胚數雖依栽培地氣溫或雜交花粉種類等之不同而稍有差異,但每品種仍各有略一定之胚數。

柑桔種子胚色依品種而不同,胚色對珠心胚與有性胚鑑別上亦可成爲極重要之依據。
本調查係採用本省柑桔砧木品種種子及若干國外引進柑桔砧木品種種子作爲材料,調查胚數及胚色以供研究柑桔珠心胚實生變異問題之參考。

本試驗供試種子中一部分蒙日本農林省興津園藝試驗支場及鹿兒島果樹試驗場之贈送,英文部份蒙洪祖仁先生摘譯特此謹致謝忱。

二、材料及方法

(一)材 料:

品種名	採種年月	調查年月	種子來源
小根占	1966. 11	1967. 9	日本鹿兒島縣果樹試驗場
扁實檸檬	1966. 11	1967. 9	日本鹿兒島縣果樹試驗場
橘	1966. 11	1967 .10	日本鹿兒島縣果樹試驗場
Thomasville Citrangequat	1966. 12	1967. 11	日本農林省園藝試驗場興津支場
Sumpson Tangelo	1966. 12	1967. 12	日本農林省園藝試驗場興津支場
Troyer Citrange	1966. 12	1968. 1	日本農林省園藝試驗場興津支場
山蜜柑	1966. 12	1968. 1	日本農林省園藝試驗場興津支場
虎頭柑	1967. 2	1968. 1	臺灣省苗栗縣通霄鎮
枳殼	1967. 10	1967. 10~11	臺灣省苗栗縣公館鄉
廣東檬檬	1967. 10	1967. 11~12	臺灣省新竹縣關西鎮
酸桔	1967. 10	1968. 1	臺灣省新竹縣新埔鎮
苦柚	1967. 10	1968. 1	臺灣省臺北縣石碇鄉

南庄橙	1968. 1	1968. 1	臺灣省新竹縣芎林鄉
Cleopatra	1968. 1	1968. 1	臺灣省新竹縣芎林鄉
代代	1968. 1	1968. 2	日本鹿兒島縣果樹試驗場
柚	1968. 1	1968. 2	日本鹿兒島縣果樹試驗場

(二) 方法：將供試柑桔種子用以小型鑷子剝去外種皮及內種皮後以針頭剔出珠孔部之中、小胚，使用20倍解剖顯微鏡調查。

三、調 查 結 果

(一) 種子胚數：將每品種種子用以20倍解剖顯微鏡調查每粒種子胚數，其各品種平均胚數及分佈狀況如表一。

表一、柑桔砧木品種胚數調查表：

品種名	胚數														每粒種子平均胚數
	1(個)	2(個)	3(個)	4(個)	5(個)	6(個)	7(個)	8(個)	9(個)	10(個)	11(個)	12(個)	13(個)	14(個)	
	%	%	%	%	%	%	%	%	%	%	%	%	%	%	
小根占	5	12	23	33	16	10	1	—	—	—	—	—	—	—	3.37
扁實檸檬	—	16	38	20	16	5	3	2	—	—	—	—	—	—	3.77
橘	—	2	13.5	16	24	17	13.5	6	4	2	1	1	—	—	5.49
Thomasville Citrangequat	—	—	—	10	30	20	10	10	10	—	10	—	—	—	6.60
Sumpson Tangelo	—	—	7	21	18	11	14	7	7	4	7	—	4	—	6.43
Troyer Citrange	—	18	14	22.5	22.5	14	9	—	—	—	—	—	—	—	4.27
山蜜柑	7	22	30	23	18	—	—	—	—	—	—	—	—	—	3.23
虎頭柑	7	40	37	13	—	3	—	—	—	—	—	—	—	—	2.70
枳殼	17	56	22	5	—	—	—	—	—	—	—	—	—	—	2.15
廣東檬檬	8	31	42	15	4	—	—	—	—	—	—	—	—	—	2.77
酸桔	—	1	7	21	24	21	12	9	4	1	—	—	—	—	5.55
苦柚	100	—	—	—	—	—	—	—	—	—	—	—	—	—	1.00
南庄橙	19	23	21	19	8	10	—	—	—	—	—	—	—	—	3.06
Cleopatra	—	—	7	7	7	13	21	11	13	14	5	—	2	—	7.34
代代	—	13	13	26	13	19	10	3	—	3	—	—	—	—	4.74
柚	18	27	27	20	2	2	4	—	—	—	—	—	—	—	2.87

由上表看之，16個供試品種中除苦柚1品種以外，其他15個品種均屬多胚性品種，可育成珠心胚實生苗，合於砧木品種必具條件。

A. 每粒種子平均胚數以 Cleopatra (7.34) 爲最多 Thomasville Citrangequat (6.60) 及 Sumpson Tangelo (6.43)次之。

本省普遍採用之砧木中以酸桔之胚數 (5.55) 爲最多，廣東檬檬 (2.77) 次之，枳殼 (2.15) 居三，以苦柚 (1.00) 爲最少。

B. 苦柚爲單胚性品種，無法得珠心胚實生。

C. 供試品種雖大部份均屬多肧性品種，但廣東檬檬、枳殼、虎頭柑、南庄橙、小根占、柚及山蜜柑之七品種，有出現單肧品種之機會。單肧種子出現率以南庄橙（19%），柚（18%），枳殼（17%）爲最高，廣東檬檬（8%）、山蜜柑（7%）、虎頭柑（7%）次之，以小根占（5%）爲最低。

（二）種子肧色：將每品種種子大、中、小肧，分離後檢定其顏色如表二：

表二、柑桔砧木品種肧色調查表：

品種名	肧色	品種名	肧色
小根占	白	枳殼	白
扁實檸檬	綠	廣東檬檬	淡綠
橘	淡綠	酸桔	草綠
Thomasville Citrangequat	淡綠	苦柚	白
Sumpson Tangelo	綠	南庄橙	※白，草綠
Troyer Citrange	白	Cleopatra	草綠
山蜜柑	白	代代	白
虎頭柑	淡綠	柚	※※白，淡綠

註：※南庄橙及※※柚均以白色爲最普遍，偶而出現之草綠，淡綠色小肧可能爲受綠色系統肧品種花粉雜交而引起之 Xenia 現象。

A. 調查品種中，扁實檸檬及 Sumpson Tangelo 兩種呈綠色、橘、Tomasiville Citrangequat、虎頭柑、廣東檬檬、酸桔及 Cleopatra 等六品種爲草綠色或淡綠色，均呈綠系統顏色。

B. 小根占、Troyer Citrange、山蜜柑、枳殼、苦柚、南庄橙，代代及柚等八品種肧均呈白色，與其他肧色花粉雜交時由其 Xenia 現象，易發現雜交有性肧，可作珠心肧實生育成上之重要依據。

四、結論及討論

本調查爲基於欲育成柑桔砧木珠心肧實生之目的而施行之。肧數之多寡不但對實生苗育成率有影響，對判斷砧木之價值問題上亦有極大之關係。如本試驗品種中之苦柚，雖由於實生苗之樹勢旺盛因而在本省普遍被採用作爲柚子、文旦或檸檬等之砧木，惟該品種仍屬單肧種，單肧種之實生苗樹勢雖往往較多肧種之實生苗爲旺盛，（TORRES, J. P. (1) 及岩崎 (3) ），但隨時有雜交同花期他品種花粉之可能，無法育成珠心肧實生直傳母體形質，不合於柑桔砧木品種必備條件，似乎不該繼續採用。

調查品種中廣東檬檬、枳殼、虎頭柑、南庄橙、小根占、柚及山蜜柑等雖均屬於多肧性品種，但常出現單肧種子，對於此等品種似乎播種前予先有肧分離並選擇之必要。

本調查品種中白色肧及綠系統顏色肧各佔半數。小根占， Troyer Citrange, ，山蜜柑、枳殼、苦柚、南庄橙，代代及柚等白色肧品種，與其他顏色肧柑桔品種花粉雜交時，由其 Xenia 現象，易發現雜交有性肧，可作珠心肧實生育成上之重要依據。本調查品種中南庄橙及柚等兩種顯出該現象。

供調查之三雜交砧木品種中 Troyer Citrange 因雙親均爲白色肧種之故肧色仍呈白，惟 Thomasville Citrangequat 由於復受 Nagami (Oval)Kumquat 之影響肧色變淡綠，Sumpson

Tangelo 似乎受花粉親 Mandarin 之影響胚色爲綠。

本調查中之胚數與岩崎氏（3）所作之胚浸漬分離法胚數比較之雖均較多，但似乎受氣溫及種子貯藏後小胚乾縮之影響，較岩政氏（2）在日本興津園藝試驗支場採用與本調查同一方式調查者之胚數爲少。

五、摘　　要

（一）本調查以育成合於吾人需要之珠心胚柑桔砧木爲目的施行。

（二）柑桔砧木雖以多胚性爲先決條件，但據本調查，"苦柚"雖在本省廣汎被採用作爲柚子、文旦及檸檬等之砧木，但該品種仍屬於單胚種，單胚者隨時有雜交之可能，不易育成無性胚實生，似乎不宜繼續採用。

（三）廣東濛檬、枳殼、虎頭柑、南庄橙、小根占、柚及山蜜柑等，雖均屬於多胚性品種，但時常出現單胚種子，該等品種於播種前該先行胚分離工作。

（四）十六個調查品種中綠色系統胚及白色系統胚各佔一半，白色胚得利用 Xenia 現象淘汰着色有性胚，可作育成珠心胚實生之依據。

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Studies on the Variation of Nucellar Seedlings upon Citrus

(1) Investigation on Number and Color of Embryo upon Some Rootstock Varieties

J. L. Weng

1. This investigation was made to obtain nucellar seedlings to be used as more excellent rootstock of citrus than existing varieties.
2. Kuyu—the most widely used as rootstock of shaddock and lemon in Taiwan—has only one embryo in a seed. In other word, Kuyu generally produces hybrid seedlings, thus this varieties is not worthy to recommend.
3. Although Rampur lime, Trifoliate orange, Kotokan, Nansho daidai, Konejime, Yamamikan and Yuzu are all polyembryony varieties, the seeds contained only one embryo were also found in these varieties respectively. This fact suggests us that the separation of embryo should be done prior to seeding.
4. Among sixteen varieties investigated, eight varieties have green and the others have white colored embryo. In the varieties having white colored embryo, it is possible to weed out the colored hybrid embryo when xenia phenomenon has been observed.

硫酸過氯酸分解法的再檢討

(關於氮的損失)

李　蘭　帝

前　　言

筆者在「大量植物樣本氮磷鉀的迅速測定法」中曾介紹過使用硫酸過氯酸分解法以測定氮素之方法。該法在屢次試驗中充分表示了與標準Kjeldahl氏法一致的結果。事後筆者再進一步使用了數種純粹有機氮化合物做試料，仍與標準Kjeldahl氏法做比較。結果出乎意料的該法比Kjeldahl氏法得了較高的測定值。筆者又再檢討予備分解時間與過氯酸的用量問題，結果發現如過氯酸使用不當時會引起氮的損失。綜合上面的結果筆者覺得有把詳細的情形報告給大家的必要，以供大家參考並希指正。

實驗方法(I)

使用的氮化合物爲 Lysine, Histidine, EDTA (Ethylenediamine-tetraacetic acid, disodium salt) 及 p-Hydroxylphenyl glycine 之四種。前兩者爲必須胺基酸之一，後兩者恐怕不會存在於通常植物體中。把試料秤 100mg 和 100mg 之濾紙(無含氮者)裝入 30c.c. 的分解瓶，加濃硫酸 4c.c. 在 300W 的電爐上加熱約20分。經這段時間可看出如下三點變化。(1)原來的黑色變爲醬油色。(2)試料已完全溶解於濃硫酸。(3)冒出白煙量已減爲很少。這三點變化可做予備分解完結的指示。予備分解完了之後取出火讓它冷却約3分鐘，加60%$HClO_4$三滴，然後繼續分解至變白色爲止。在標準 Kjeldahl 氏法試料取量與硫酸過氯酸法同，但另加 1.5 克的催化劑(K_2SO_4 與 $CuSO_4$ 9:1 之混合物)依常法分解之。

分解物稀釋至100ml後取出一部分依擴散法測定氮量

表1　硫酸過氯酸法與 Kjeldahl 氏法的比較

Table I.　N contents as determined by H_2SO_4-$HClO_4$ and Kjeldahl digestion (%)

氮化合物 N Compound	Kjeldahl 法	H_2SO_4-$HClO_4$ 法	理論値 N% Calculated
Lysine	12.6 (82.4)	14.7 (96.0)	15.3
Histidine	19.2 (96.2)	19.4 (97.0)	20.0
EDTA	6.02 (80.0)	7.00 (93.0)	7.53
P-Hydroxyl phenyl glycine	7.70 (91.8)	8.00 (95.4)	8.39

註：括弧內數值爲測定值對理論值之百分比。

Note: Figures in parenthesis show the ratios of N determined to calculated values taken as 100%。

結 果 與 討 論

含氮量之測定結果在表 I。由此可知除在 Histidine 兩法一致之外，硫酸過氯酸法所測氮量均比 Kjedahl 氏法爲高。理論含氮量爲由分子式計算所得的值。除在Lysine 和 EDTA 此值較爲可靠之外，在其他化合物此值與眞正含氮量怕有出入。

實驗方法（II）

供試試料爲水稻葉，經熱乾及粉碎等手續。秤取試料 200mg 於分解瓶，加濃硫酸 4ml以供分解。予備分解時間分爲20及50分兩種。20分爲相當於實驗方法（I）所採用之分解方法。如予備分解繼續至50分，雖顏色看不出變化，但白煙完全消失，可淸楚地看到硫酸沸騰。如過氯酸一次處理仍不能使分解完成者乃處理二次。其用量爲一滴。表 II 中以十號表示者爲此意。過氯酸之加法已在實驗方法（I）中提過。

表 II　予備分解時間及過氯酸用量對氮測定值的影響

Table II. N contents of rice leaf as determined by different predigestion time and amount of $HClO_4$

予備分解時間 Predigestion time / $HClO_4$ 用量 Amount of $HClO_4$	20分 20 min			50分 50 min		
1滴＋1滴 1 drop+1 drop				1.42 1.43	1.42	1.42 1.45
2滴 2 drops				1.44 1.40	1.40	1.44 1.37
2滴＋1滴 2 drops+ 1 drop	1.38 1.37	1.43	1.38 1.40			
3滴 3 drops	1.43 1.42	1.42	1.45 1.42	1.33	1.26	1.31
4滴 4 drops	1.22		1.22	1.22	–	1.21
Kjedahl法		1.33	1.40	1.43		

註：＋號表示分次加$HClO_4$之意。

Note: +means $HClO_4$ was added in devided dosage.

結 果 與 討 論

不同予備分解時間及不同過氯酸之用量對氮素測定值之影響在表 II。以時間表示予備分解之進行程度只是一種相對的尺度而已，因加熱條件無法嚴格規定。由結果可知多餘的過氯酸會引起氮的損失。顯然地所需的過氯酸量又與予備分解時間有關，時間長所需量較少，再則據筆者的經驗試料的種類亦有關係。一般氮素含量高者其需要量也較多，例如分解大豆，茶葉、牛奶粉等物，20分的

予備分解後，三滴的過氯酸常有不足的現象。這些事實告訴我們要做此法必須小心。誠然這是該法的一大缺點。補救方法爲實驗者應作予備試驗，先拿以Kjeldahl氏標準法確定過氮含量的樣本作試料，多作幾次硫酸過氯酸分解法的試驗以體會其要領。要避免過氯酸用量的過剩可做分次處理。如在本實驗第一次加二滴的方法，不管予備分解時間的長短均爲安全的方法。

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NOTE ON THE SULFURIC PERCHLORIC ACID DIGESTION FOR NITROGEN DETERMINATION OF PLANT SAMPLE (ABOUT THE LOSS OF NITROGEN)

by

L. T. Li

Summary

Plant sample is digested with sulfuric acid only, which is called predigestion. After predigestion, perchloric acid is added to complete the digestion. The end of predigestion is indicated by 1) solution of the sample, 2) color change from black to dark brown, 3) small amount of fume etc. Perchloric acid in excess amount caurses loss of nitrogen. Preliminary test is necessary for the beginner. Perchloric acid treatment in devided dosage is also helpful to keep digestion from excess of oxidant.

稻熱病同一病斑所得菌株病原性之研究*

簡　錦　忠

前　言

稻熱病病原菌（*Piricularia oryzae* Cav.）之生理分化與病原性變異問題之研討，在稻作抗稻熱病育種與檢定試驗方面言之，無疑是個重要而亟須先行探明之課題，蓋欲以一病原性不穩定之病原菌供作一未知抗病程度之稻品種抗病性測定，為一不可能之擧。有關稻熱病病原菌 race 之問題佐佐木氏（1922—1923）（5）首先報告其分化現象之存在，Tochinai, Chimamura（1932）（8）從其供試41稻熱病病原菌株中，分別歸納為九種培養型，鈴木氏（1963）（7）曾以同一稻熱病病斑所得許多單胞後代中，以胞子發芽之形態，附着器（Appresorium）於不同溫度下之發芽情形等之不同而歸納為 12 種 homokaryotic type，中西、今村等氏（1960）（4）謂於單一病斑上所形成之病原胞子，有時混有不同病原性之存在。

於本省，有關稻熱病病原菌生理小種之研究，已進行數年，從省內各稻作栽培區採集罹病標本分離數百菌株，以其對供試16判別稻品種致病性之不同，而歸類為25個不同生理小種（3, 1, 2）

本試驗之目的為求進一步探討於同一病斑所得菌株之不同單胞間及各單胞前後代之間有無病原性之異同。

本研究進行時，得楊騰金先生之協助，謹誌謝忱。

材料與方法

a. 供試病原菌：

3K—39S：標本採自高雄區，由花育52號品種之感病型病斑（S type）所分離。

3C—1681R：標本採自嘉義區，由外國引進品種之抗病型病斑（R type）所分離。

病原菌以酵母澱粉培養基（Yeast extract 2g., Soluble starch 10g., Dist water 1,000cc），試管斜面於28°C培養一星期後，加注無菌水，作成胞子懸浮液，以 Lambertis Method 行單胞分離，將所得單胞菌株先於試管斜面培養一星期，記錄培養型後作成懸浮液，移植四角培養瓶，於 28°C 定溫平面培養14天，供作接種試驗之用。

b. 培養型之記載：依下列標準：

A型：氣生菌絲灰白色，1mm 高，胞子形成極多。

B型：氣生菌絲灰白色，1mm 高，胞子形成少。

C型：菌落鐵灰色，輪紋狀，上有白色菌塊，氣生菌絲 2mm 高，胞子形成極多。

D型：氣生菌絲灰白色，2mm 高，胞子形成尚多。

E型：氣生菌絲白色，叢簇狀，較粗，3～4mm 高，胞子形成量僅次於 C 型，常產生變異型菌絲。

F型：氣生菌絲淡褐色，1mm 高，胞子形成由少至多，因菌株而異。

c. 病原性之測定：

以崑山五香粳、臺中65號、稗稈稻、臺中171號、嘉農育280號、關東 51 號、農林 21 號、Cutsugulcul 、高雄大粒清油、臺中低脚烏尖等10品種。供作判別稻品種，以鉛製小盤（7×7×10cm）盛取本所試驗水田土壤於溫室內，行旱栽並重施氮肥，稻種在催芽播種前以「谷樂生

※本研究之完成得國家長期發展科學委員會之補助。

(Granosan)」1/1,000 倍稀釋液，浸漬消毒，待稻苗生長達本葉 3～4 片時，以噴霧法行人工接種，將病原菌分生胞子懸浮液均勻噴射於稻葉表面，置適當溫度與濕度下保持24小時後移置溫室，約經10天，調查感病情形、病斑型態分作感病性 (Susceptible) 中間性 (Moderate) 及抗病性 (Resistant) 等予以記載。

結果與討論

一、培養型：繼代單胞分離各單胞後代於酵母澱粉試管斜面培養基所呈現之培養型列於表一：

表一：供試菌株培養型

Table 1: The variability of cultural type of isolates of *P. oryzae* upon successive single spore transfers.

(A:S 菌株)

培養代數	S-1	S-2	S-3	S-4	S-5	S-6	S-7	S-8	S-9	S-10
一	E	D	D	D	D	D	D	E	E	E
二	E	E	E	E	E	D	D	E	E	E
三	E	E	E	E	E	D	D	E	E	E
四	E	E	E	E	E	E	E	E	E	E
五	E	E	E	E	E	E	E	E	E	E

((B:R 菌株)

培養代數	R-1	R-2	R-3	R-4	R-5	R-6	R-7	R-8	R-9	R-10
一	D	D	D	D	D	D	D	D	D	D
二	D	D	D	D	D	D	D	E	E	D
三	D	D	D	E	D	D	E	E	E	D
四	E	D	D	E	E	E	E	D	E	D

註：S＝自感病性病斑所得菌株 (3K-39S)；R＝自抗病性病斑所得菌株 (3C-1681R)；一、二、三、四、五＝單胞培養代數：1,2,3,4,5,6,7,8,9,10＝單胞菌株代號。

由表一(A)看出在第一代之各號單胞菌株中1,8,9,10等號單胞菌株爲E型外，其他各號單胞菌株均爲D型。在第二代培養中2,3,4,5各號單胞菌株由D型變爲E型，其他仍保持與其前代相同，在三、四兩代之培養中，變異較少，至第五代則每一單胞菌株均已呈E型。單胞菌株6,7號則至第四代才由D型變爲E型。表一(B)中之變化略有所異，其第一代培養各單胞均屬 D 型，第二代中8,9號單胞菌株及第三代中4,7號單胞菌株均由D型變爲 E型，第四代中1,5,6等號單胞菌株，由D型變爲 E 型，8號單胞菌株於第四代由E型變爲D型。在前後四代培養中2,3,10等號單胞菌株均始終呈D型。

表二、各代單胞對判別稻品種之感病情形

Table 2: Pathogenic reaction of ten differential rice varieties to isolatos of *P. oryzae* upon successive single spore transfers.

a：感病型菌株 (S)

判別稻品種	S-1					S-2					S-3					S-4					S-5				
	一	二	三	四	五	一	二	三	四	五	一	二	三	四	五	一	二	三	四	五	一	二	三	四	五
崑山五香粳	S	S	S	S	S	S	S	S	R	R	S	S	S	S	S	S	S	S	S	S	S	R	R	R	R
臺中65號	S	S	S	S	S	S	S	S	S	R	S	S	S	R	R	S	S	S	M	M	S	S	S	S	S
稗稈稻	S	S	R	R	R	S	R	R	R	R	S	R	R	R	R	S	R	R	R	R	S	R	R	R	R
臺中171號	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
嘉農育280號	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
關東51號	M	R	R	R	R	S	R	R	R	R	S	R	R	R	R	R	R	R	R	R	R	R	R	R	R
農林21號	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
Cutsugulcul	R	R	R	R	R	R	R	R	R	R	S	R	R	R	R	S	R	R	R	R	R	R	R	R	R
高雄大粒清油	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
臺中低脚烏尖	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	S	R	R	R	R

判別稻品種	S-6					S-7					S-8					S-9					S-10				
	一	二	三	四	五	一	二	三	四	五	一	二	三	四	五	一	二	三	四	五	一	二	三	四	五
崑山五香粳	S	S	S	S	S	S	S	S	S	R	S	S	S	S	S	S	S	S	S	S	S	M	M	M	M
臺中65號	S	R	R	R	R	S	R	R	R	R	S	S	S	S	M	S	S	S	S	S	S	M	M	M	M
稗稈稻	R	R	R	R	R	S	R	R	R	R	S	S	R	R	R	S	M	M	M	M	S	R	R	R	R
臺中171號	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
嘉農育280號	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
關東51號	S	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
農林21號	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
Cutsugulcul	S	R	R	R	R	S	R	R	R	R	R	R	R	R	R	S	R	R	R	R	R	R	R	R	R
高雄大粒清油	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
臺中低脚烏尖	M	R	R	R	R	S	R	R	R	R	R	R	R	R	R	R	R	R	R	R	S	R	R	R	R

b. 抗病型菌株 (R)

判別稻品種	R-1				R-2				R-3				R-4				R-5				R-6				R-7				R-8				R-9				R-10			
	一	二	三	四	一	二	三	四	一	二	三	四	一	二	三	四	一	二	三	四	一	二	三	四	一	二	三	四	一	二	三	四	一	二	三	四	一	二	三	四
崑山五香粳	S	S	S	S	S	S	S	S	S	S	R	R	S	S	R	R	S	S	S	M	S	S	R	R	S	S	S	S	M	M	R	R	R	R	R	R	S	S	R	R
臺中65號	S	S	S	S	S	S	S	S	S	S	R	R	S	S	R	R	S	S	M	M	R	R	R	R	S	S	S	S	R	R	R	R	S	S	S	S	S	S	S	S
稗稈稻	S	S	R	R	S	S	S	S	S	R	R	R	R	R	R	R	M	M	R	R	M	R	R	R	R	R	R	R	S	S	S	R	R	R	R	R	M	R	R	R
臺中171號	S	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	M	M	M	M	R	R	R	R	R	R	R	R	R	R	R	R
嘉農育280號	R	R	R	R	R	R	R	R	M	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
關東51號	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
農林21號	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
Cutsugulcul	S	R	R	R	S	S	R	R	S	S	R	R	S	S	R	R	S	S	R	R	R	R	R	R	R	R	R	R	S	S	R	R	S	R	R	R	R	R	R	R
高雄大粒清油	S	S	R	R	M	R	R	R	S	S	R	R	R	R	R	R	R	R	R	R	R	R	R	R	S	R	R	R	R	R	R	R	S	S	R	R	R	R	R	R
臺中低脚烏尖	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	S	S	R	R	R	R	R	R	R	R	R	R	R	R	R	R	S	R	R	R	S	M	R	R

註：S:感病型病班　　一、二、三、四、五：培養代數
　　R:抗病型病斑　　1.2.3………10：單胞菌株代號

由表二(a)可看出，自感病性(S)病斑所得菌株之10單胞培養第一代之病原性對崑山五香粳、臺中65號均呈感病性病斑，對臺中171號、嘉農育280號、農林21號、高雄大粒清油均呈抗病性病斑，此外對稗稈稻、關東51號、Cutsugulcul、臺中低脚烏尖之致病性不盡一致，但S-5與S-10, S-4與S-9, S-1與S-8之致病反應一致，於培養第二代之病原性已有一部份轉弱，於第一代呈感病反應而第二代呈抗病反應者，除S-1及S-8之外均有此現象。於第三代培養中，除S-1, S-8對稗稈稻之病原性由感病型轉弱爲抗病型以外，其餘各單胞之致病反應一如其前代。第四代培養中，S-2對崑山五香粳及S-3對臺中65號之致病性由感病型轉呈抗病型，S-4對臺中65號由感病型轉呈中間型(M)，此外各單胞並無變化。在第五代培養中，S-2對臺中65號，S-7對崑山五香粳均由感病型轉呈抗病型，S-8對臺中65號由感病型轉呈中間型。

在前後五代單胞培養中，S-1, S-3, S-4, S-6, S-8, S-9對崑山五香粳及S-1, S-3, S-5, S-9對臺中65號均保持感病型致病反應。對所有供試判別品種言之，S-2與S-7均呈抗病型反應，爲病原性較弱之顯著者，S-1與S-9除對稗稈稻之反應不同外，對其他各品種之致病力爲一致，此兩單胞爲保持較强之致病性者，S-3與S-6, S-4與S-8對各品種之致病反應爲一致，對崑山五香粳呈感病型對臺中65號呈抗病型或中間型。

表二(b)爲抗病型(R)病斑所得菌株。在其第一代培養各單胞菌株中對崑山五香粳與臺中65號，除R-6, R-8, R-9以外均呈感病性病斑，對嘉農育280號，關東51號，農林21號及臺中171號等品種，除R-1, R-3及R-7略差異型外均呈抗病性反應，此外對稗稈稻、Cutsugulcul、高雄大粒清油、臺中低脚烏尖等品種之致病反應亦不一致。在第二代培養中，R-1對臺中171號，Cutsugulcul, R-3對稗稈稻，R-7對高雄大粒清油，R-9對臺中低脚烏尖等品種之致病性均由感病型轉呈抗病型，而R-2對高雄大粒清油，R-3對嘉農育280號，R-6, R-10對稗稈稻，乃由中間型轉呈抗病型，由感病型轉呈中間型者僅R-10之對臺中低脚烏尖。在第三代培養中，由感病型轉呈抗病型者有R-1對稗稈稻及高雄大粒清油，R-2, R-3, R-4, R-5, R-8對Cutsugulcul, R-1, R-3, R-9對高雄大粒清油，R-4對崑山五香粳，R-5對稗稈稻及R-10對臺中低脚烏尖，而R-5對臺中65號爲由感病型轉呈中間型。在第四代培養中，變化轉少，僅R-5對崑山五香粳由感病型轉呈中間型，及R-8對稗稈稻由感病型呈抗病型。

上述復以表列方式列於表三。

據上述可知自田間（自然界）採取稻熱病標本，選呈感病性病斑或抗病性病斑，經單胞分離後，其後代隨機選10個單胞培養，經四或五代觀察其培養型，兩者之間無一定的形態之別。又將每一代之病原接種於10判別稻種，測定其致病反應結果，自感病型所得菌株（3K-39S）對10判別稻種中之四種（臺中171號、嘉農育280號、農林21號、及高雄大粒清油）均呈抗病性，而在第一代之致病反應呈感病性反應者，如果是抗病性强之稻種，至第二代之病原多半呈爲抗病性反應，反之判別稻種中抗病性極弱之稻種（崑山五香粳、臺中65號）其變化較少，如S-1, S-9對該兩種品種雖經培養五代，各代之致病反應呈感病性，又S-3, S-4, S-6, S-8等對崑山五香粳各代均呈感病性反應。再者自抗病性病斑（R）所得菌株(3C-1681R)對10判別稻種之致病反應，對10判別稻種中之3品種（嘉農育280號、關東51號、農林21號），均呈抗病性反應外，其他7種判別稻種都有感病性反應之存在。但在第一代之致病反應呈感病性反應而第二代則大部份轉呈抗病性反應，其傾向與自感病性病斑所得菌株相同。

總而言之，自感病性病斑所得菌株對10判別稻種之致病反應，不能全部呈感病性反應，又自抗病性病斑所得菌株對判別稻種之致病反應亦未能均呈抗病性反應，而且兩者之菌株繼代培養時其病原性都有遞減之傾向。又病原菌之培養型與病原性之關係並無一定的直接關係。故欲獲繼代培養菌之病原性一定不變，需待今後之再檢討。

表三：同一病斑所得各單胞培養於不同代數所呈病原性之轉變

Table 3: The variability of virulece of isolatos of *P. oryzae* upon successive single spore transfers

供試判別品種	感病型菌株												抗病型菌株								
	二			三			四			五			二			三			四		
	S→M	S→R	M→R	S→M	S→R	M→R	S→M	S→R	M→R	S→M	S→R	M→R	S→M	S→R	M→R	S→M	S→R	M→R	S→M	S→R	M→R
崑山五香粳	10	5						2			7						3 4 10	8	5		
臺中65號	10	6 7					4	3		8	2					5	3 4				
稗稈稻	9	2. 5. 3. 7. 4.10.			1. 8									3	6 10		1	5		8	
臺中171號														1							
嘉農育280號															3						
關東51號		2 6																			
農林21號																					
Cutsugulcul		3.7 4.9 6.												1 9			2.5. 3.8. 4.				
高雄大粒清油														7	2		1. 3. 9.				
臺中低脚烏尖		5 7 10	6										10	9			5	10			

註：二、三、四、五為培養代數。
S→M由上一代之S型轉呈M型，餘類推
阿拉伯數字代表單胞菌株代號。

摘　要

1. 本試驗之目的，在於探討自同一病斑分離所得不同單胞病原性之異同與其繼代單胞培養之病原性變異，供試病原菌有 3K-39S 及 3C-1681R 兩菌株，前者係分離自高雄區，花育58號品種之感病型病斑，後者係分離自嘉義區，由外國引進品種之抗病型病斑。各菌株均以10個單胞培養供試。病原性判別稻品種爲崑山五香粳、臺中65號、稗稈稻、臺中171號、嘉農育280號、關東51號、農林21號、Cutsugulcul 、高雄大粒清油及臺中低脚烏尖等10品種。

2. 培養型之鑑定，以氣中菌絲之高度、顏色及胞子形成之多寡爲分類依據。3K-39S 之第一代培養各單胞菌株中有 D 型及 E 型之不同，唯培養至第五代均轉呈 E 型。3C-1681R 之第一代均爲 D 型，而至第四代除 4 個單胞菌絲仍爲 D 型外，其他 6 單胞菌株轉呈 E 型。

3. 自感病型病斑所得菌絲之不同單胞培養對10判別品種之致病反應不能全部呈感病性反應，又自抗病性病斑所得菌絲之不同單胞培養亦不能均呈抗病性反應，而兩菌株在繼代培養中，病原性均有遞減之傾向，又病原菌之培養型與病原性之間並無一定之直接關係。

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STUDIES ON THE PATHOGENICITY OF THE DIFFERENT MONOCULTURES OF *PIRICULARIA ORYZAE* CAV. ISOLATED FROM A SINGLE BLAST LESION

Chin-chung Chien

SUMMARY

1. The present experiment was made to investigate the pathogenicity of the different single-spore cultures of *P. oryzae* Cav. isolated from a single lesion of rice plant, and to examine the variability of their virulence during successive single-spore cultures. Isolate 3K-39S obtained from a lesion of susceptible infection type on variety Hua-yu 58 collected from Kaohsiung area, and isolate 3C-1681R obtained from a lesion of resistant infection ype on a newly introduced variety collected from Chiayi area were subjected to the single-spore isolation. Ten single-spore cultures derived from each isolate were tested for their pathogenicity on ten differential rice varieties by means of artificial inoculation.

2. The culture types of each subculture were classfied on the basis of texture and color of aerial mycelia and sporulation. Four monocultures derived from isolate 3K-39S have transformed from type D to type E, while the others maintained as type E at the fifth generation. Six monocultures of isolate 3C-1681R have changed from type D to type E, while the others remained as type D throughout four generations.

3. The different monocultures originated from the same isolate did not produce the lesions of the same infection type on the differential rice varieties. The pathogenicity of the progenies of the two isolates are not all identical to the pathogenicity of the parental cultures. Generally, the virulence of successive single-spore-cultures decreased from generation to generation. There is no distinct correlation between the culture type and the pathogenicity.

柑橘瘡痂病藥劑防治試驗

李 永 松　　劉 康 鑑

一、前　　言

柑橘瘡痂病乃一種眞菌 *Elsinoe fawcetti* But. & Jen. 引起的病害。此病害廣汎地分佈於世界各地，在臺灣亦爲主要果實病害之一。澤田氏1907年在臺灣發現此病害並記載之（5）。羅氏報告此病害發生於員林一帶，椪柑受害嚴重，果實之發病率幾達50%左右（2）。莊氏指出臺灣柑桔罹病品種爲椪柑、桶柑、海梨；其被害率在果園爲40～50%，在苗圃有高達85%以上者（3）。瘡痂病之藥劑防治，最初使用石灰波爾多液，並獲得卓越之效果，但此藥劑却間接地促進介殼蟲、紅蜘蛛等蟲害之發生。鑑於此，農試所曾於1960年前後進行藥劑選擇試驗，選出不含銅之殺菌劑富爾培(Phaltan)爲防治此病害之用，並正式列入推廣（3）。在日本經多年來對此病害防治之研究，終獲得大富丹(Difolatan)及雷彈(Delan)爲瘡痂病防治藥劑。

本文就受委託探究雷彈在臺灣環境條件下防治瘡痂病之效果及檢討其他藥劑防治瘡痂病之效果，一併整理報告，藉供防治此病害之依據。

二、材料及方法

(一) 供試藥劑種類：

供試藥劑名稱、形態及有效成分如表一：

Table 1. Fungicides used for laboratory and field evaluation for citrus scab control

Compound	Form	Active Ingredient
Delan (雷彈)	W.P.	2,3-Dinitrile-1,4-dithiaantraquinone 75%
Gurasun (穀仁生)	W.P.	2,3-Dichloro-1,4-naphthoquinone 17% Zinc ethylene bisdithio carbamate 25% Sulfur 24.0%
Dithane M-45 (大生 M-45)	W.P.	Ionic coordination of zinc and manganese ethylene bisthiocarbamate 80%
Dithane Z-78 (大生 Z-78)	W.P.	Zinc ethylene bisdithiocarbamate (Zineb) Minimum 75%
Phaltan (富爾培)	W.P.	N-trichloromethylthiophthalimide 50%
Difolatan (大富丹)	W.P.	Cis-N-[(1,1,2,2-tetachloroethyi)thiol]-4-cyclohexene-1,2-dicarboximide 80%

(二) 阻止胞子產生試驗：

供試藥劑先配製成8,000、2,000、500、125及31.25 ppm 之高濃度溶液，取不同濃度溶液各5 ml. 分別混合於 45 ml. 之洋菜培養液中，使藥劑濃度成爲800、200、50、12.5及3.125 ppm，均勻混合後分別倒入培養皿內製成平板。經檢定具有旺盛胞子產生能力之病組織，作成切片，平放於平板上，每一平板放置10片。於 25°C 之溫度下經72小時後鏡檢。根據病組織切片上胞子產生之有無及多少，分爲無、少、中、多及甚等五級。各以0、1、2、3及4代表其級數，求出胞子產生百分率。

並以對照區爲 0 %，求出胞子產生阻止率。

$$胞子產生百分率=\frac{(0\times n_1)+(1\times n_2)+(2\times n_3)+(3\times n_4)+(4\times n_5)}{4(n_1+n_2+n_3+n_4+n_5)}\times 100\%$$

$n_1 \sim n_5$ 爲不同胞子產生等級之病組織切片數

（三）田間藥劑撒佈試驗：

於臺北及新竹二區選出過去罹病較爲嚴重之果園供作試驗。田間設計以二株爲一小區，四重複，隨機排列。撒佈藥劑濃度分爲2.5 kg. / 100 l. 及 1.25 kg. / 100 l. 二種。使用半自動噴霧器均勻地撒佈於果樹上。藥量以每株 4 公升爲準。

於病斑發生顯著時，調查各處理果粒上之病斑數。被害度以病斑所佔面積分爲健全、輕度、中度和重度等四級，並以0、1、2及 3 代表各級數，求出被害率。再以對照區爲0%，求出病害防除率。

$$被害百分率=\frac{(0\times n_1)+(1\times n_2)+(2\times n_3)+(3\times n_4)}{3(n_1+n_2+n_3+n_4)}\times 100\%$$

$n_1 \sim n_4$ 係各該當被害果之數目

三、結　　果

（一）阻止胞子產生試驗：

六種供試藥劑中，阻止胞子產生之效果以大富丹爲最優，在 3.125 ppm 之低濃度下其阻止率已接近 90%。穀仁生和大生 M-45 在 12.5 ppm 、富爾培在 50 ppm 及雷彈在 200 ppm 時，始發生與大富丹 3.125 ppm 相當之效果。大生 Z-78 在 50 ppm 時，其阻止率爲 69.4%；在 200 ppm 時，爲100%（圖 1）。

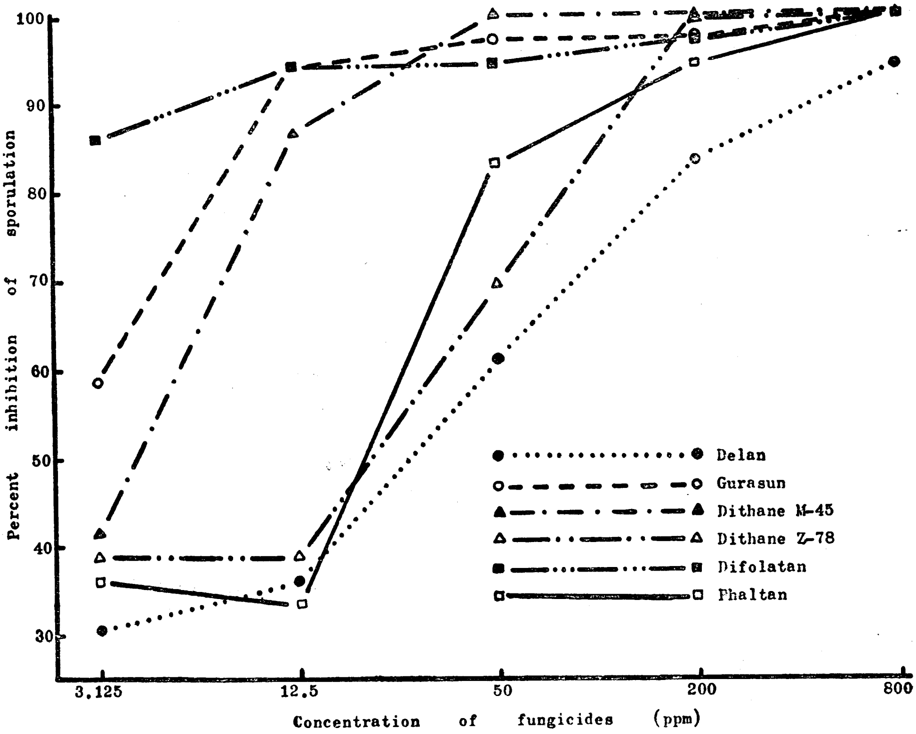

Fig. 1. Effects of fungicides at different concentrations on sporulation of citrus scab causal fungus on agar plates.

（二）田間藥劑撒佈試驗：

田間藥劑撒佈試驗在新竹縣關西鎮下三屯里、同縣橫山鄉十分寮及臺北縣石門鄉草里村等三處舉行。藥劑撒佈日期，關西區於 3 月29日、4 月27日及 5 月10日；石門區於 4 月27日、5 月 9 日及 6 月 9 日；橫山區於 4 月10日、5 月 1 日及 5 月18日。試驗結果之調查，橫山區於 6 月12日、關西區於 6 月13日、石門區於 6 月26日舉行。每株以調查50顆果粒為原則，若因落果不能達到此數目時，則調查存留於果樹上之全部果粒。

六種供試藥劑中，於關西區以雷彈2.5 kg. /100 l. 效果最優，大富丹1.25 kg. /100 l. 次之；於石門區，以大富丹 1.25 kg. /100 l. 效果最優，大富丹2.5 kg. /100 l. 次之；於橫山區，以大生 Z-78 2.5 kg. /100 l. 效果最優，大富丹1.25 kg. /100 l. 次之。做為對照藥劑之富爾培，其效果甚不理想，在關西區列於末位，於其他二區亦不佳。榖仁生之效果不安定，於關西區優於富爾培，於石門區劣於無撒藥區（圖二）。

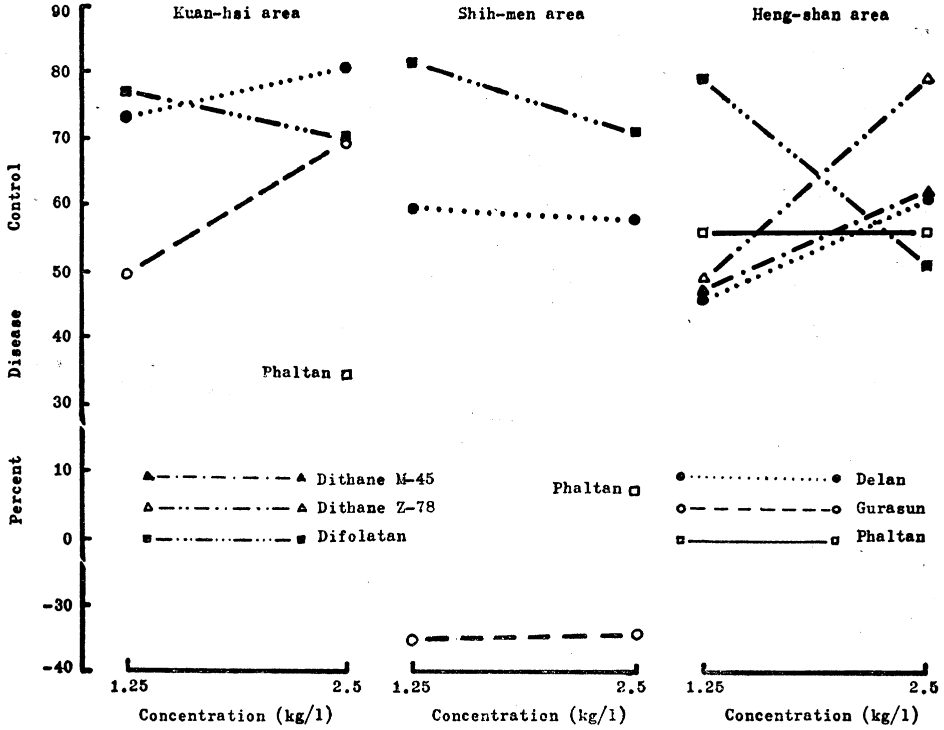

Fig. 2. Control of citrus scab by applications of fungicides at rates of 1.25 kg and 2.5 kg per 100 liters water at orchards of Taipei and Hsinchu area, April–June, 1967.

四、討論及結論

一種殺菌劑，其防治病害效果之優劣，就藥劑本身而言，除決定於藥劑之殺菌作用外，還決定於藥劑之保護作用。雷彈於室內試驗阻止胞子產生之效果，尚不及富爾培，但在田間撒佈之效果却僅次於大富丹。此乃因雷彈雖然阻止胞子產生之力量不強，但其保護作用則甚強，故能達到防病之效果（7）。榖仁生阻止胞子產生之效果僅次於大富丹，但其田間撒佈之效果則甚為不安定，在石門區甚至於有助長瘡痂病發生之傾向，此可能該區雨量過多影響榖仁生藥效之所致。

大富丹阻止胞子產生及田間撒佈之效果皆較他藥劑爲優，不失爲瘡痂病防治之優良藥劑。惟其在三處試驗區皆低濃度（1.25 kg./100 l.）之效果優於高濃度（2.5 kg./100 l.）。應用此藥劑防治梨黑星病時亦有類似之現象（6），其原因何在有待將來之闡明。福爾培之防治病害效果比其他藥劑遜色。大生 Z-78 對胞子產生沒有强力之阻止作用，但在田間撒佈則顯示優良之效果。其藥劑之安定性與防病效果，則有待進一步檢討。

於適當時期撒佈藥劑乃爲防治病害成功要訣之一。瘡痂病之第一次傳染由老病斑傳染於新葉；再由新葉病斑上之胞子行第二次傳染於其他新葉及果實上。基於此，防除新葉發生病斑乃爲至要。本試驗計劃開始稍遲，第一次撒藥時，春梢上已有瘡痂病病斑發生。雖如此，其防除率尙有80%，顯示在落花後甫結小果時，開始撒佈優良藥劑尙未失去防治病害之良機。倘若能在新芽萌發後，行第一次撒佈藥劑保護新葉免受第一次傳染源之侵入、抑制病斑之形成而減少第二次傳染源；再於落花後甫結小果時，行第二次撒佈藥劑，果葉皆加以保護，則其效果將更臻理想。

實際防除上，使用大富丹濃度 1.25 kg./100 l. 或雷彈濃度2.5 kg./100 l. 於新梢形成時行第一次藥劑撒佈，甫結小果時行第二次藥劑撒佈，經三星期再行第三次藥劑撒佈，則可得防除瘡痂病之效果。

五、摘　　要

六供試藥劑中，阻止柑桔瘡痂病病原菌產生胞子之效果，以大富丹（Difolatan）爲最優，其次爲穀仁生（Gurasun）及大生 M-45（Dithane M-45）。富爾培（Phaltan）再次之，大生 Z-78（Dithane Z-78）及雷彈又更次之。

在田間撒佈試驗中，以大富丹1.25 kg./100 l.、雷彈2.5 kg./100 l. 及大生 Z-78 2.5 kg./100 l. 之效果爲最佳。大富丹2.5 kg./100 l.、大生 M-45 2.5 kg./100 l. 及雷彈 1.25 kg./100 l. 次之。大生Z-78 1.25 kg./100 l.、大生 M-45 1.25 kg./100 l.及富爾培 2.5 kg./100 l. 和 1.25 kg./100 l. 又次之。穀仁生之效果不穩定。

供試藥劑中，大富丹於室內及田間試驗皆爲最優良之藥劑。穀仁生在室內試驗阻止胞子之效果甚爲良好，但在田間試驗則甚不穩定。雷彈於室內試驗之結果不理想，但在田間試驗則顯示良好之防病效果。

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LABORATORY AND FIELD EVALUATIONS OF FUNGICIDES FOR CONTROL OF CITRUS SCAB

By

Y. S. Lee and K. C. Liu

In testing inhibitory effects of fungicides on sporulation of the scab causal fungus, six fungicides at the different dosage rates were incorporated into agar plates on which sections of diseased tissue were inoculated. Difolatan W-80 gave the best inhibitory effect. It inhibited nearly 90% sporulation of the fungus at the concentration as low as 3.125 ppm. Gurasun and Dithane M-45 showed the same inhibitory effect at the concentration of 12.5 ppm. The minimum concentrations for Phaltan and Delan to show the same inhibitory effect were 50 ppm and 200 ppm respectively. Dithane Z-78 at the concentration of 50 ppm inhibited 69.4% sporulation of the fungus, it gave 100% inhibition at the concentration of 200 ppm.

Six fungicides were evaluated for their effectiveness in controlling citrus scab at three orchards in the different areas. Difolatan at the rate of 1.25 kg./100 l., Delan at 2.5 kg./100 l., and Dithane Z-78 at 2.5 kg./100 l. gave the best control for citrus scab. Difolatan at the rate of 2.5 kg./100 l., Dithane M-45 at 2.5 kg./100 l., and Delan at 1.25 kg./100 l. were less effective than foregoing treatments. Only fair control was obtained with Dithane Z-78 at the rate of 1.25 kg./100 l., with Dithane M-45 at 1.25 kg./100 l., and with Phaltan at 1.25 kg./100 l. and at 2.5 kg./100 l.

Difolatan W-80 at the rate of 1.25 kg./100 l. or Delan at 2.5 kg./100 l. applied at times of new flushes, petal falling, and three weeks after second application is being recommended for citrus scab control.

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THE GENUS EPHEDRUS HALIDAY OF TAIWAN

(HYMENOPTERA: APHIDIIDAE)

By

Ching-Shen Liu

In Taiwan only one species, *Ephedrus japonicus* Ashmead, had been descripted by Gahan in 1926, after that time there is no report about aphid parasites recorded.

Acknowledgment

I wish to express my sincere thanks to Miss S. C. Chiu for her continuous kind direction and Mr. C. C. Tao for his kindness in identifying aphids. Thanks are also due to Mr. K. S. Lin for sending me his collected specimens.

Genus Ephedrus Haliday, 1833

Ephedrus Haliday 1833, Ent. Mag. 1: 261, 485.
Type-specimens: *Bracon plagiator* Nees
Elassus wesmael 1835, Nouv. Mém. Acad. Sci. Bruxelles 19: 248
Type-specimens: *Aphidius parcicornis* Nees

Head transverse, as wide as or wider than thorax. Antennae 11—12 segmented in both sexes. Parasidal furrows always at least partially distinct. Venation of wings nearly complete (in rank of subfamily). Fore wing: Pterostigma triangular and more or less prolongated at either end, pterostigmal cell complete, radial vein reaching wing-margin, median vein complete, three radial cells developed, cubital vein from greatest part distinct, median cell complete; basal cell of hind wing distinctly complete. Propodeum either distinctly areolated, with areolae smooth or slightly rugose along carinae, or rugose, with carinae more or less distinct. Abdomen lanceolate, compressed apically in females and ovate in males; first abdominal segment either slender and long or nearly square, with various sculpture (coarsely rugose to nearly smooth); ovipositor sheaths either slender and long, with single hairs and nearly edged or rounded at apex, or wide, relatively quickly narrowing towards apex, densely pubescent on all surface and bluntly pointed at apex.

Stary separated a new subgenus *Lysephedrus* from *Ephedrus* in 1958 by the especial characters, that of ovipositor sheath are wide, on the proximal third relatively quickly and strongly narrowing towards apex, densely pubescent, bluntly pointed and slightly curved on the apex. But no specimens were collected by writer in Taiwan belong to the subgenus *Lysephedrus*.

Subgenus Ephedrus s. str.

Ephedrus s. str., Stary 1958, Acta Faun. Ent Mus. Nat. Pragae 3: 66—67 Type-specimens: *Ephedrus plagiator* (Nees)

Head transverse, as wide as or wider than thorax; antennae short, 11—12 segmented and the same in both sexes. Mesonotum with the notaulices incomplete. Propodeum areolated. Abdomen lanceolate, sparsely haired; first abdominal tergite rugose or smooth partially; ovipositor sheaths long and narrow, gradually nearly straightly narrowing towards apex, with single hairs; straight or slightly curved. Apex of ovipositor sheaths nearly edged or rounded. This subgenus is easily recognized by the shape of straight ovipositor sheath and compressed abdomen in females.

General distribution of species: Pleaearctic, Nearctic, Aethiopian, Oriental, Australian region.

Key to the Taiwanese species of subgenus *Ephedrus*

1. Mesoscutum in the confluent point of notaulices with distinctly deep fovea; 1st abdominal tergite (fig. 5) robust, only a little longer than its width……*persicae* Froggatt
- Mesoscutum without fovea in the confluent point of notaulices; 1st abdominal tergite two times as long as wide or more …………………………………………………… 2
2. 1st abdominal tergite about 2 or 2.2 times as long as wide at spiracles; ovipositor sheath short, relatively narrowing to apex. ………………………………………………… 3
- 1st abdominal tergite 2.5 or 3 times as long as wide at spiracles ; ovipositor sheath slender. ……………………………………………………………………………………… 4
3. 2nd abscissa of radial vein more twice of 2nd interradial vein (fig. 16) about 2.4:1 in ratio; ovipositor sheath quickly relatively narrowing towards the apex(fig. 13)…… …………………………………………………………………………… *nacheri* Quilis
- 2nd abscissa of radial vein shorter than two times of 2nd interradial vein (fig. 17) about 1.8:1 in ratio; ovipositor sheath a little stout, gradually relatively narrowing towards the apex (fig. 12)……………………………………………………………*robustus* n. sp.
4. 1st interradial vein longer than intermedian vein about 3:2 in ratio (fig. 18); 1st abdominal tergite 2.5 times as long as wide at spiracles; propodeum (fig. 21) with distinctly lateral carinae around either spiracles…………………………… *campestris* Stary
- 1st interradial vein as long as intermedian vein (fig. 19); 1st abdominal tergite 3 times as long as wide………………………………………………………… *japonicus* Ashmead

1. *Ephedrus* (*Ephedrus*) *persicaeè* Froggatt

Ephedrus persicae Froggatt, 1904, Agric. Gaz. Sydney 15: 611—612
Ephedrus nevadensis Baker, 1909, Pomona J. Ent. 1:23
Ephedrus nitidus Gahan, 1917, Proc. U. S. Nat. Mus. 53(2197):195.
Ephedrus vidali Quilis M. P., 1931, Eos, 7:72—74
Ephedrus pulchellus Stelfox, 1941, Proc. R. Irish Acad. 46(B):133—139.
Ephedrus interstitialis Watanabe, 1941, Ins. Matsum. 15:139—140.
Ephedrus impressus Granger, 1949, Mém. Inst. sci. Madagascar 2(A):412.
Ephedrus (*Ephedrus*) *holmani* Stary, 1958, Acta Faun. Ent. Mus. Nat. Pragae 3:63, 68—70.

Ephedrus (*Ephedrus*) *palaestinensis* Mackauer, 1959, Beitr. Ent. 9:867—868.

This species is most easily recognized by the long notaulices and the dimple-like impression on the mesonotum near the scutellar suture.

♀: Body length 1.9mm, fore wing 1.9mm, antennae 1mm. Head (fig. 10) transverse, slightly dilated behind eyes and strongly narrowing posteriorly, smooth, shiny, sparsely haired, wider than thorax at tegulae, as wide as 2.2 times of transfacial line; transfacial line as wide as twice of clypeuo-antennal line; occipital carinae distinctly margined; the mutual distance of occelli about diameter of antennal socket; clypeus slightly oval, convex, with 6—9 long hairs, completely separated from face by narrow groove; tentorial pits deep; eyes slightly prominent, longitudinal eye-diameter 1.5 as long as wide; temple roundly convex and as wide as transverse eye-diameter. Antennae 11 segmented, rather short, only reaching the apex of thorax, 1st flagellar segment 1.4 as long as 2nd and 4 times as long as wi-de, apical segment acute, preceeding segment subequal to apical one.

Thorax smooth, shiny, sparsely haired; mesoscutum prominent above pronotum, notaulices completely reching 3/4 apical mesoscutum, with deep and well marked fovea in confluing point; scutellum convex, prolongatly triangular, margined laterally, very rising the level of mesonotum; mesopleuron smooth, shining. Fore wing (fig. 15) transparent; pterostigma triangular, 4 times as long as wide; 1st abscissa of radial vein slightly shorter than 2nd interradial vein, as long as 0.4 of 2nd radial abscissa; 1st interradial vein in its insertion point on median vein and 2nd interradial vein colourless. Hind metatarsus as long as three following segments combined. Propodeum (fig. 20) areolated, with wide pentagonal areolae.

Abdomen lanceolate, slightly longer than the head and thorax combined; tergite 1 (fig. 5) robust, only a little longer than width, slightly roundly prominent, rugose, with more or less distinctly central carinae and two lateral longitudinal carinae reaching about 5/6 apex, without lateral depression. Following segments smooth, shining, sparsely haired. Genitalia (fig. 11).

Coloration: Brownish black to black except ventral scape and pedicel brownish, and legs brownish yellow.

♂: unknown.

Distribution: Almost cosmopolitan.

Specimens examined: 3♀♀; 28 IV 1966 Wushe, Taiwan; 4♀♀, 5 IV 1966, 12♀♀, 13 III 1967, Taipei, Taiwan.

Habitat: This species occurs rather commonly in secondary forest habitats. It may also be found in peach where the host of *M. persicae* usually existed. Sometime it occurs in vegetable field near the secondary forest.

Hosts: *Myzus persicae* Sulzer, *Lipaphis erysimi* Kaltenbach.

Occurrence in Taipei area: IV.

Notes This species attacks *Myzus munecola* Matsumura and *Trichosiphoniella momonis*(Matsumura) in Japan, but mainly attacks *Myzus persicae* in Taiwan, so the *E. persicae* may be regarded as a valuable perasite for biological control of *Myzus* aphid.

2. *Ephedrus* (*Ephedrs*) *nacheri* Quilis

Ephedrus nacheri Quilis M. P., 1934, Eos, 10:17—19; Stary 1962, Opusc. Ent. 27:93—94

According to Stary's description, the writer examined the specimens of this species collected in Taiwan as same as that of Stary collected in Czechoslovakia.

This species differs from other species in the long 2nd radial cell. (The following description after Stary)

"♀: Head transverse, smooth, shiny, sparsely haired, wider than thorax at tegulae, Temple equal to width of transverse eye-diameter. Gena as wide as 1/3 of longitudinal eye-diameter; clypeus with about 9 hairs. Tentorio-ocular line equal to half of intertentorial line. Antennae 11 segmented, filiform, as long as head and thorax combined. F_1 3 times as long as wide at apex. F_1 and F_2 of equal length. F_1-1 (rarely 0), F_2-2, F_3-3. Praeapical and apical segements distinctly separated. Distance between antennal socket and eye-margin shorter than socket-diameter.

Mesoscutum smooth, shiny, with sparse long hairs at base, margins and along effaced notaulices. Notaulices distinct in ascedent part, deep, feebly crenulate. Propodeum areolated (fig. 23). Upper areola with 6—8, lower with 3—6 hairs. Dics of areolae shiny, almost smooth, in the neighbourhood of carinae feebly rugose. Wing (fig. 16); Pterostigma 4 times as long as wide. Interradial vein 1 about 1/3 shorter than radial abscissa 2. Radial abscissa 1 shorter than width of pterostigma.

Abdomen lanceolate. Tergite 1 (fig. 6) twice as long as wide at spiracles, with strongly prominent central and less prominent lateral longitudinal carinae; with deep lateral impressions in the hind third before apex. Surface shiny, slightly rugose, sparsely haired. Spiracular tubercles feebly prominent, situated at the end of the first third of the segment. Width at apex somewhat more than at spiracles. Following tergites smooth, shiny, sparsely haired. Genitalia (fig. 13).

Coloration: Head black; mouthparts yellow brownish to brownish. Antennae brown black, apex of pedicel, basis of F_1 more or less yellowish. Thorax black propodeum sometimes brownish. Wings slightly brownish. Venation brown. Legs yellow brownish, coxae, femora and apical parts of tibiae darkened. Abdominal tergite 1 light brown to brown, following tergites brown.

Length of body 1.5—2.1mm.

♂: Similar to the female except sexual differences."

Specimens examined: 2♀♀, 5 III 1966; 1♀, 4 IV 1957, Taipei, Taiwan. 1♂, 1150m, 13 X 1957, Chi-tou, Nan-tou hsien, Taiwan.

Distribution: Czechoslovakia, Taiwan.

Occurrence in Taipei area: III, IV.

Notes: The samples of this species of Taiwan were collected with sweeping method, so the host and habitat are unknown.

3. *Ephedrus* (*Ephedrus*) *robustus* n. sp.

This species differs other species from the stout ovipositor sheath.

♀: Body length 1.8mm, fore wing 1.7mm, antennae 1mm. Head (fig. 9) transverse, rounded, smooth, shining, sparsely haired, quickly narrowing posteriorly, wider than thorax at tegulae; temple as wide as transverse eye-diameter; longitudinal eye-diameter as long as 2.6 times of gena; transfacial line as long as twice of clypeuo-antennal line; eyes oval, prominent; clypeus roundly convex, separated by distinguish groove; tentorial pits deep and wide. Antennae 11 segmented, beyond the apex of abdominal tergite 1; 1st flagellar segment 1.1 times as long as 2nd, 3 times as long as wide; apical segment gradually acuted towards apex, slightly longer than preceeding one.

Thorax smooth, shining, sparsely haired; medium lobe of mesoscutum prominent in front part in lateral profile; notaulices wide, smooth, only on base; scutellum roundly convex, laterally margined, a little rising the level of mesoscutum in lateral profile. Propodeum (fig. 22) rather roundly prominent in lateral profile, carinae forming central broad pentagonal areola and lateral small areola around either spiracles. Fore wing (fig. 17); pterostigma triangular, 2nd abscissa of radial vein only a little longer than intermedian vein. Legs normal, sparsely haired. Hind metatarsus as long as three following segments.

Abdomen lanceolate, longer than head and thorax combined. Tergite 1 (fig. 7) about 2.2 time as long as wide at spiracles, with a central and two lateral longitudinal carinae, rather depressed apically and laterally Following segments smooth and shining. Genitalia (fig. 10); ovipositor sheath stout, a little wide on base and relatively narrowing towards apex.

Coloration: Brownish black. Head black; face, mouthparts, propodeum and abdominal tergite 1 dark brown; Legs brownish yellow; other parts of body are brownish black.

♂: 1st flagellar segment about 2.5 times as long as wide. Abdomen only a little longer than head and thorax combined. Otherwise similar to female except sexual difference.

Holotype: ♀, 10 II 1966, Taipei, Taiwan, reared from *Aphis spiraecola* Patch on citrus; Allotype: ♂, same date of holotype but in 7 II 1966; Paratypes: 4♀♀, 7 II 1966, Taipei, Taiwan, reared from *Aphis spiraecola* Patch on citrus; 4♀♀, 3 IV 1966, Taipei, Taiwan, reared from *Longiungius sacchari* (Zehntner) on sorghum.

Distribution: Taiwan.

Hosts: *Aphis spiraecola* Patch on citrus, *Longiungius sacchari* (Zehntner) on sorghum.

Habitat: This species is very valuable in attacking to *Aphis spiraecola* Patch on citrus in February and to *Longiungius sacchari* (Zehntner) on sorghum in May, in Taipei area.

Occurrence in Taipei area: II, V.

4. *Ephedrus (Ephedrus) campestris* Stary

Ephedrus (Ephedrus) campestris Stary 1962, Opusc. Ent. 27 (1-2): 87-90.

According to Watanabe's description of *E. japonicus* Ashmead in 1941, this species

differs from *E. japonicus* Ashmead in the following points: the 1st interradial vein longer, the abdominal tergite 1 shorter, the ovipositor sheath short only a little longer than the half of hind metatarsus and the distinctly lateral small areola around either spiracle on propodeum; and differs from *E, plagiator* (Nees) in equal length of 1st interradial vein and 2nd radial abscissa.

♀ : Body length 2–2.5 mm, fore wing 2–2.5 mm, antennae 1.2–1.4 mm. Head (fig. 3) transverse, rounded, smooth, shiny, sparsely haired, quickly narrowing posteriorly, wider than thorax at tegulae; temple as wide as transverse eye-diameter; gena as long as 1/3 of longitudinal eye-diameter; transfacial line subequal to the half of width of head, as long as twice of clypeuoantennal line; eyes oval, slightly prominent, sparsely shortly haired; clypeus straightly frontly margined, with 5–7 long hairs, separated by distinguish groove; tentorial pits deep and wide. Antennae 11 segmented, reaching beyond the apex of abdominal tergite 1, 1st flagellar segment 1.2 as long as 2nd and 4 times as long as wide, apical segment gradually acuted towards apex and a little longer than preceding one.

Thorax (fig. 24); pronotum smooth, shiny; median lobe of mesoscutum comparatively prominent in front part in lateral profile; notaulices deep, wide and rugose on base, smooth afterwards; scutellum roundly convex, laterally margined, very rising the level of mesonotum in lateral profile. Propodeum (fig. 21) areolated; carinae forming central pentagonal areola and distinctly small lateral areola around either spiracles. Fore wing (fig. 18); pterostigma triangular, 2nd abscissa of radial vein 1.5 times as long as 2nd interradial vein and only little longer than intermedian vein, 1st interradial vein 1/3 longer than intermedian vein. Legs normal, slender, sparsely haired; tibia apically and tarsi more densely haired. Hind metatarsus as long as four following segments.

Abdomen lanceolate, longer than head and thorax combined about 10:7 in ratio. Tergite 1 (fig. 8) slender, about 2.5 times as long as wide at spiracles, deeply excavated basally, strongly convex, with two longitudinal carinae runing out from base and more or less distinct central longitudinal carinae, depressed apically and two lateral impressions. Following abdominal segments smooth and shining. Genitalia (fig. 14).

Coloration: Brownish black. Head black; clypeus, mouthparts, base of 1st and 2nd flagellar segment, scape, pedicel and abdominal tergite 1 dark brown. Legs brownish yellow. Venation of wing pale brown. The other parts of body brownish black.

♂ : Antennae densely haired, reaching the apex of abdominal tergite 1, 1st flagellar segment as long as 3 times of its width. Otherwise similar to female except sexual difference.

Specimens examined: 7♀♀, 12♂♂, 17 II 1966; 9♀♀, 16♂♂, 21 II 1966; 1♀, 6♂♂, 15 II 1966; 1♀, 8♂♂, 19 II 1966, Taipei, Taiwan.

Distribution: Europe, Far East.

Habitat: It occours commonly in various kinds of steppe type habitates. In Taipei area mainly attacks the *Dactynotus* sp.,

Hosts: *Dactynotus formosanus* (Takahashi), *Dactynotus* sp.

Occurrence in Taipei area: II.

Note: The problem of that the specimens collected by the writer from the hosts of

Aphis spiraecola Patch, *Sinomegoura citricola* (Van der Goot) and *Acyrthosiphon pisum* Harris belong to *plagiator* Nees or *campestris* Stary is being under taking.

5. *Ephedrus* (*Ephedrus*) *japonicus* Ashmead

Ephedrus japonicus Ashmead 1906, Proc. U. S. Nat. Mus. 30:187; Gahan 1926, Proc. U. S. Nat. Mus. 70:7.

The writer has not obtained the specimens of *E. japonicus* Ashmead which were identified by Gahan or Ashmead, and therfore the following descriptions were in accordance with Watanabe's.

"♀: Black; mouth-parts fusco-testaceous, sometimes dark brown; antannae dark brown, the two basal joints tinged with yellow, and the 3rd and 4th joints yellowish at the base. Legs rufo-testaceous, all the coxae more or less infuscated. Wings hyline; stigma and veins pale brown; tegulae dark brown. Abdomen black, with a large pale spot on the 2nd tergite; 1st tergite sometimes fusco-testaceous.

Head transverse, smooth and shining with whitish pubescence; antennae a little longer than the head and thorax united, 11-jointed; 3rd joint a little longer than the 4th' Thorax almost smooth and shining; parasidal furrows impressed anteriorly. Propodeum nearly smooth and shining, strongly carinated, with a rather broad median pentagonal areola. Stigma rather large, slightly elongated towards the base, the distance from the extreme base to the junction of the stigma and the radius about 2.5 times the breadth of the stigma; 1st abscissa of the radius about one-third the length of the 2nd, which is a little less than twice the length of the intercubitus; recurrent nervure inserted in the 2nd cubital cell; nervulus postfurcal; nervus parallelus inserted in the 2nd discoidal cell, not interstitial with the medial nervure. Abdomen longer than the head and thorax united, lanceolate; 1st tergite linear, 3 times as long as broad, deeply excavated basally, smooth in the excavated portion, from which the surface strongly convex, coarsely rugose, sometimes nearly smooth, with a median longitudinal carina dividing at the middle, enclosing a triangular area, and with a broad transverse impression near the apex; 2nd and following tergites smooth and shining; ovipositor sheath a little shorter than the hind metatarsus, slender, conical, truncate at the apex.

Length, 2.5-3 mm.

♂: Closely resembles the female in general structure and colour, but differs from the latter in the following points:-

Darker than the female in colour; antennae rather shorter, 11-jointed, the 3rd joint as long as the 4th, which is stout, shallowly impressed at the inner side near the base. Length, 2-2.5 mm.

Distribution: Japan, Formosa.

Hosts: *Brachysiphoniella graminis* (Takahashi), *Aphis rumicis* (Linne).

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臺灣蚜蟲寄生蜂 Ephedrus 屬分類

劉　清　淳

中 文 摘 要

本文所述包括臺灣產蚜蟲寄生蜂 Ephedrus 屬共五種，其中一新種屬臺灣土產 *E. robustus* n. sp. 主要寄生於黍蚜 *Longiungius sacchari* (Zehntner) 及捲葉蚜 *Aphis spiraecola* Patch 。文中先述本屬及亞屬特徵，次立檢索表便於查定，每一種附有異名、形態、分佈、寄主、習性及臺北區發生之時期，以便應用於蚜蟲生物防治上參考。

本屬臺灣五種寄生蜂所寄生蚜蟲之寄主範圍如下：
桃蚜 *Myzus persicae* Sulzer, 僞菜蚜 *Lipaphis erysimi* Kal. 黍蚜 *Longiungius sacchari* (Zehntner), 捲葉蚜 *Aphis spiraecola* Patch, 白尾紅蚜 *Dactynotus formorsanus* (Taka.), ，月桔蚜 *Sinomegoura* citricola (van der Goot) 豌豆蚜 *Acyrthosiphon pisum* Harris, 禾草粉蚜 *Brachysiphoniella graminis* (Tak.)，羊蹄蚜 *Aphis rumicis* (Linne).

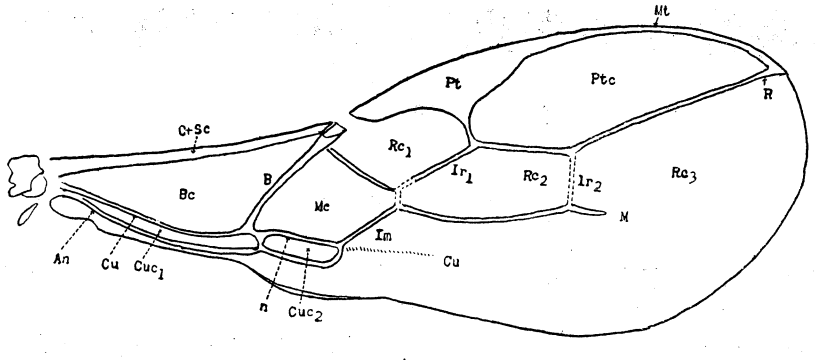
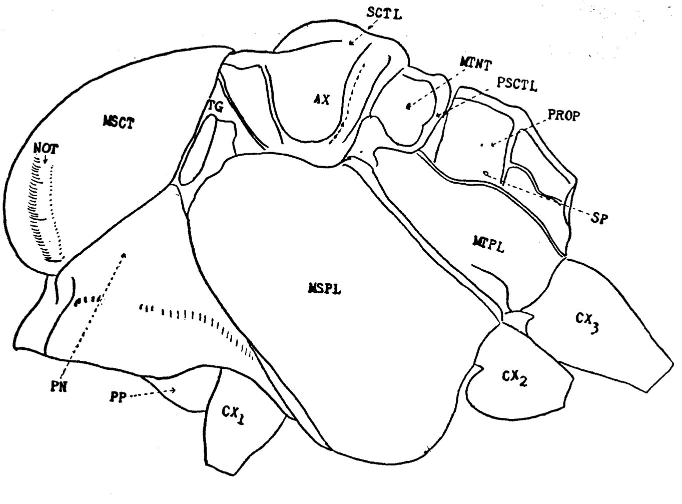


Fig. 1. Nomenclature of fore wing: An-anal vein; B-basal vein; Bc-basal cell; C-costal vein; Cu-cubital vein; Cuc $_{1,\ 2}$-cubital cell 1, 2 ; Im-intermedian vein; Ir $_{1,\ 2}$-interradial vein 1, 2; M-median vein; Mc-median cell; Mt-metacarpus; n-nervulus; R-radial vein; Rc $_{1,\ 2,\ 3}$-radial cell 1, 2, 3, ; Pt-pterostigmal cell; Sc-subcostal vein.

Fig. 2. Nomenclature of thorax: AX-axillae; CX $_{1,\ 2,\ 3}$-coxae 1, 2, 3; MSCT-mesoscutum; MSPL-mesopleuron; MTNT-metanotum; MTPL-metapleuron; NOT-notaulic; PN-pronotum; PROPO-propodeum; PP-propleuron; SCTL scutellum; SP-spiracles; TG-tegulae.



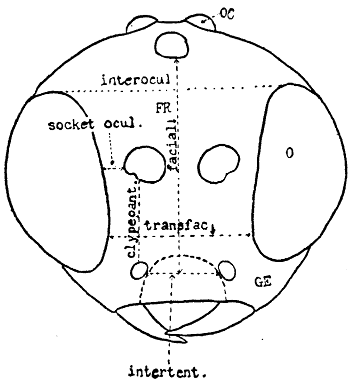


Fig. 3. Nomenclature of head and distances: clypeoant. -clypeoantennal line, facial-facial line, FR-fron, GE-gena, interocul-interocular line, intertent-inter tentorial line, MD- mandible, O-eye, OC-ocellus, socket ocul-socket ocular line.

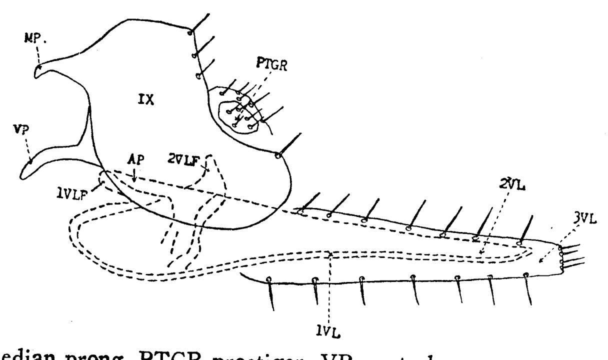


Fig. 4. Nomenclature of genitalia: IX-→ tergite 9, 1VL-valvulae 1, 1VLF-first valvifer, 2VL-valvulae 2, 2 VLF-second valvifer, 3 VL-valvulae 3, Ap-anterior prong, MP-median prong, PTGR-proctiger, VP-ventral prong.

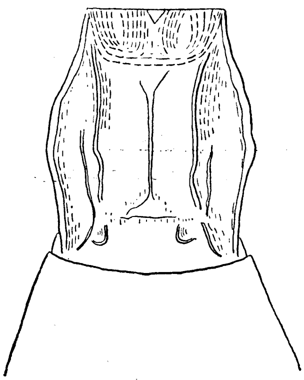


Fig. 5. 1st abdominal tergite of *E. persicae* Froggatt

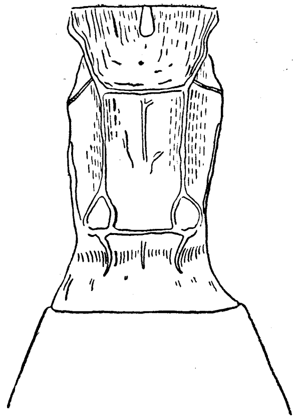


Fig. .6 1st abdominal tergite of *E. nacheri* Quilis;

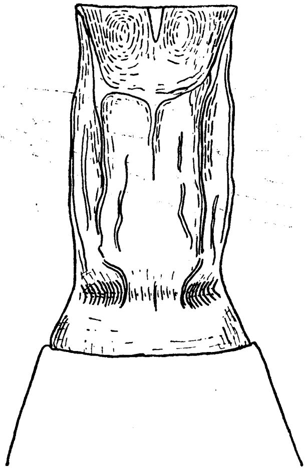


Fig. 7. 1st abdominal tergite of *E. robustus* n. sp.,

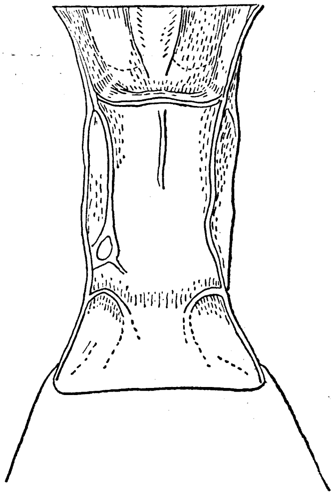


Fig. 8. 1st abdominal tergite of *E. campestris* Stary

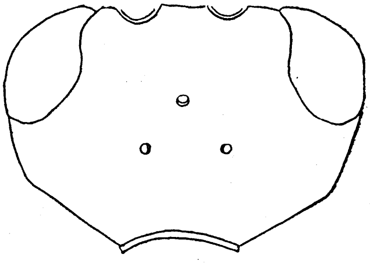


Fig. 9. Head of *E. robustus* n. sp.

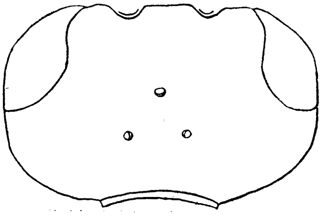
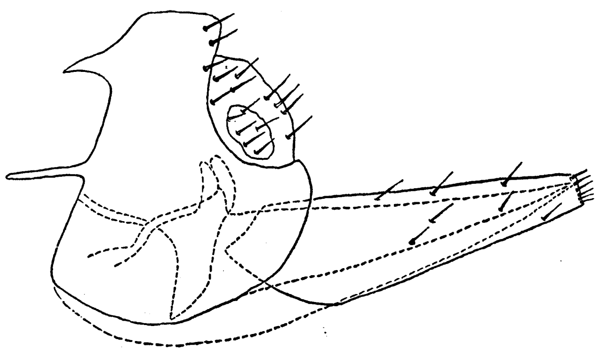


Fig 10. Head of *E. persicae* Froggatt



← Fig. 11. Genitalia of *E. persicae* Froggatt

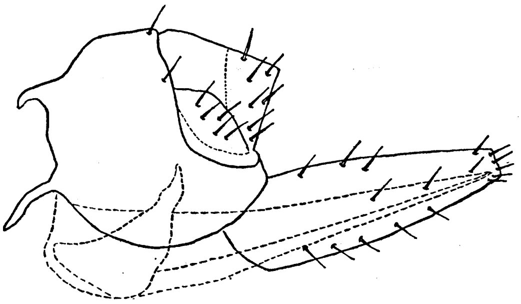
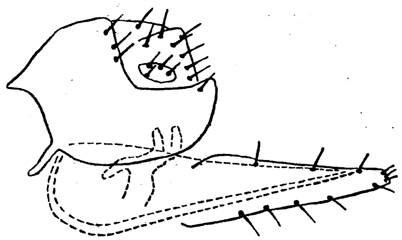


Fig. 12. Genitalia of *E. robustus* n. sp. →



← Fig. 13 Genitalia of *E. nacheri Quilis*;

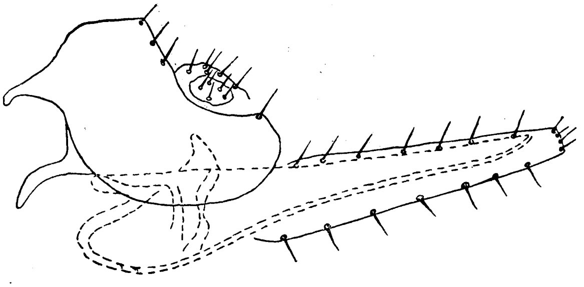
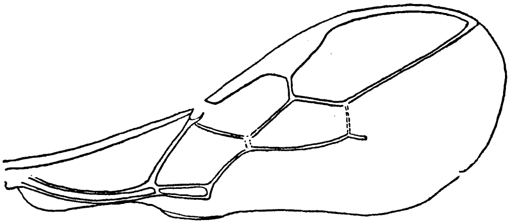


Fig. 14. Genitalia of *E. campestri* Stary; →



← Fig. 15. Fore wing of *E. persicae* Froggatt.

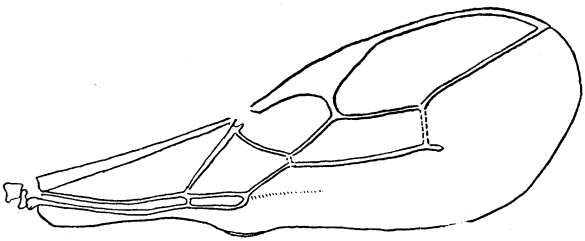
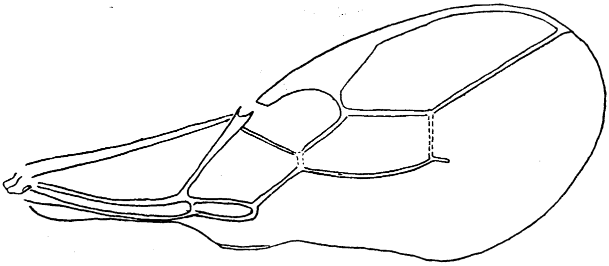


Fig. 16. Fore wing of → *E. nacheri* Quilis;



← Fig. 17. Fore wing of *E. robustus* n. sp.;

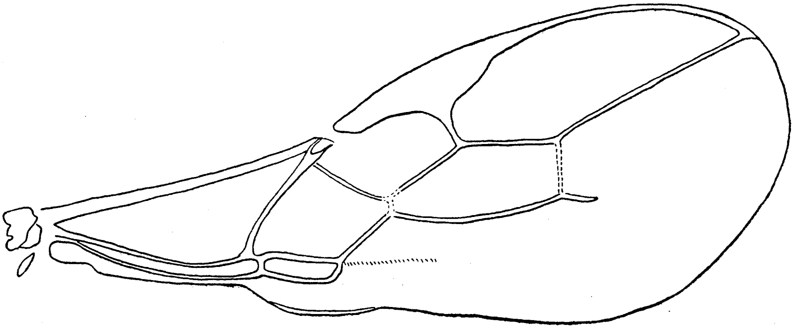
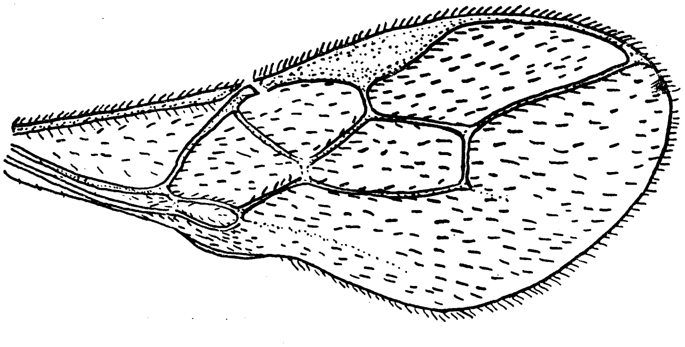


Fig. 18. Fore wing of → *E. campestris* Stary.



← Fig. 19. Fore wing *of E. japonicus* Ashmead (after Watanabe)

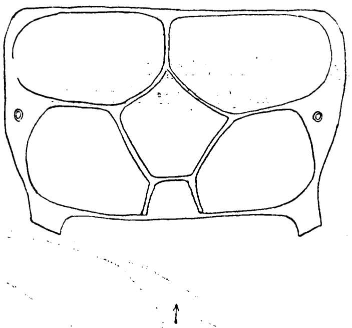


Fig 20. Propodeum of *E. persicae* Froggatt

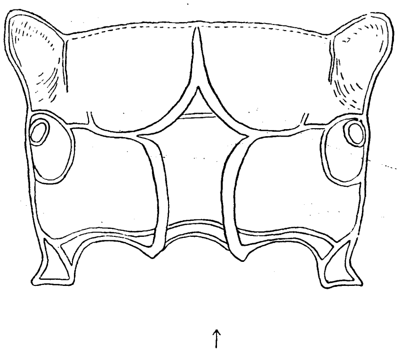


Fig 21. Propodeum of *E. campestris* Stary;

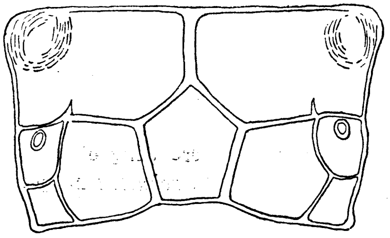


Fig. 22. Propodeum of *E. robustus* n. sp.;

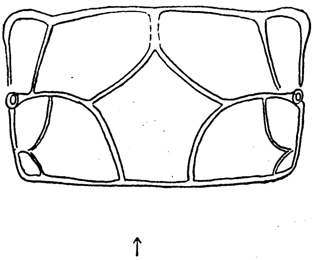


Fig. 23. Propodeum of *E. nacheri* Quilis

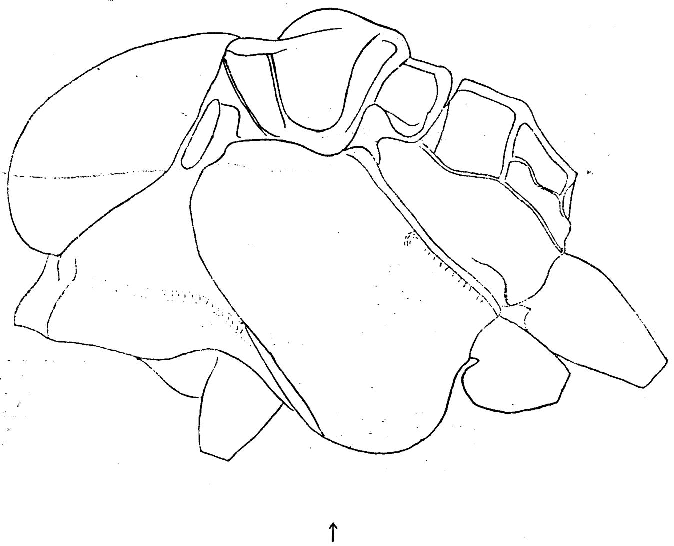


Fig 24. Thorax of *E. campestris Stary.*

文　獻　介　紹
ABSTRACTS OF LITERATURE

一、水稻 Zenith 型品種對稻熱病抵抗性之遺傳〔清澤茂久（1967）日本遺傳學雜誌17(2)：99～107〕

利用美國稻Zenith型，其後代Fukei 67以及其他已知抗病因子型之稻種爲材料，研究7系統稻熱病病原菌之抗病行爲。採用注射法和噴霧法兩種方式接種。接種後一星期，由接種部位之病斑型及數目來判定其抗病性。 F_2 和 F_3 植株則根據注射法中之病斑型及噴霧法中之最大病斑，分成 r（抗），m（中抗）和 S（感病）三型。在 F_3 之系統中分類要求更嚴格。

其結果發現有兩對因子 *Pi*-a 和 *Pi*-z 控制着抗病反應。其後者爲一新發現之抗病因子。*Pi*-z 控制中度之抵抗性(semi-resistance)，同時和 *Pi*-a, *Pi*-k 及 *Pi*-ta 等因子相互獨立。但亦發現 *Pi*-z 和 *Pi*-i 之間有些微的連鎖關係。同時，此7系統之因子型亦曾根據其病原性（Pathogenicity）之相互關係而定出。同時也發現，有一 Zenith 之後代 Fukunishiki 亦攜有與原親本相同之 *Pi*-z之因子。（嚴盛添）

二、二元體稻細胞核之 DNA 含量〔片山(1967)育種學雜誌 17(3)：177—181〕

前人曾報告說 Feulgen 染色値與 DNA 之絕對含量（由化學或紫外線測光儀測定）有關。故 Feulgen 測光儀便被廣泛地應用於測定細胞內 DNA 之含量。水稻十一品系（包含 AA, BB, CC, EE 和FF等五種 genome）被採用於本研究中。每品系測定兩次。其方法爲將水稻根端組織垂直切下，儘可能切薄，其薄片固定於冰醋酸酒精（Acetic-alcohol;1:3）溶液（室溫下）15分鐘。其次用N-HCl(60°C)脫水 5 分鐘，然後再用 Feulgen 染色劑（20°C)染 3 小時。染色後之根端用 SO_4 溶液洗 3 次共十分鐘 。再將根尖 2mm 壓碎於 10％ glycerol 和45％ acetic acid 中 。將此樣本置於二種不同波率（505 和 555mμ)測光儀下測定其對光的吸收率。然後再根據 Mendelsohn 氏之表推算每細胞核內 DNA 之含量。

在本研究中同 genome 內各品系間，其 DNA 含量並無顯著差異。此與 Pachytene Aanalysis 之結果相同。*O. brachyantha* 之細胞核內含 DNA之量最少，約等於 genome A 或 genome C 之一半， 並與單元體稻之 DNA 含量相似。*O. australiensis* 含有最高量之 DNA。*O. punctata* 之 DNA 含量與 *O. sativa* f. spontanea 者無大差異，但却較 *O. australiensis* 者顯著減少。另由四元體稻 BBCC 和 CCDD 內之 DNA 含量與 *O. officinalisis* 之 DNA 含量比較結果，推定二元體稻之祖先可能是 B 或 D genome。上述結果，均與細胞學之觀察相符。最後由整個資料比較結果看來，各 genome 間 DNA 含量之多少，可以 F<B≒A≒C<E 式表示之。（嚴盛添）

三、水稻品種 Pi No. 4 之抗稻熱病性遺傳〔清澤茂久（1967）育種學雜誌17(3)：165～172〕

清澤（1967）報告兩對因子 *Pi*-a 和 *Pi*-ta 控制 Pi No. 1 品種之抗病性。同時亦知 *Pi* No. 2 和 Pi No. 1 具有相同之抗病因子。而 Pi No. 3 和 Pi No. 5 則與 Pi No. 4 之因子型相同。本研究利用 Pi No. 4 和農林17及 Pi No. 1 間雜交。其雜交後代接以7個不同之病原系統。其育苗法爲將水稻種子播於 18×45×10cm 之木箱中，共十行，每行17株。然後放置於自動調節溫度之溫室中。秧苗長至 4～5 葉片時接以病原孢子懸浮液。若有必要時，一週後再接種一次。接種方式採用噴霧法和注射法兩種。通常是第一次接種用噴霧法，第二次接種用注射法，如此可調節環境之影

響。病斑型之調查分爲 r, m 和 s 三型。

在 Pi No. 4×農林 17 之 F_2 和親本研究中，其結果顯示出，對 Ina 72 和 Ina 168 兩病原系統之抗病性呈15：1之分離比。而另外對 Ken 54—20 和 Huko 1 系統則爲一對顯性因子支配其親本間的抗病性。同時亦進行 F_3 植株之檢定，其結果證實了 F_2 世代中分離比之假設。

另在 Pi No.4×Pi No. 1 之 F_2 世代中，發覺接以 Ken 50—20 和 Huko 1 兩菌種者。若先用噴霧法接種 Ken 54—20，無病斑發生。若改用注射法接種 Haku 1，則病斑立即出現。此種現象，並非爲病原菌之不純，而可能是由於親本之抗病性程度的關係。故其植株表現 r, m 和 s 之比例與 F_2 世代相對分組相符（P＝0.7—0.8）。由此無感病植株之分離，表示出 Pi No. 4 之抗病因子，可能是（或很接近）*Pi*-ta因子。（嚴盛添）

四、Gibberellin 對溫州蜜柑浮皮防止效果之檢討 〔中野孝美，長田一美（1967）農業及園藝 42 (12)：1849—1850〕

溫州蜜柑浮皮果可損果實外觀，減低市場價值，造成經濟上之損失頗鉅。然此現象在溫暖地方，或多或少發生而且被認爲不能避免之生理現象。據倉岡氏，Gibberellin (GA) 處理可防止溫州蜜柑之浮皮現象，但 GA 處理亦可導致延遲果實着色作用與成熟期等不良影響。

著者等以 1,10 或 50 ppm 之3種濃度之 GA 噴霧於18年生之宮川早生之側枝，研究低濃度 GA 之處理，處理次數，時期等影響。處理次數及時期如次：處理1次者，於7月1日、8月1日或9月1日：處理2次者於7月1日及8月1日：處理3次者於7月1日、8月1日，9月1日處理。GA 處理對果實發育無顯著影響可見，但濃度愈高或處理時期愈晚，果實之着色作用愈慢。就10月28日收穫之果實而言，處理時期愈晚，果實之剝皮愈困難，此現象甚至在濃度最稀薄之 1ppm 區亦可看出。至於處理時期過晚之 50ppm 處理區之果實，囊皮之硬化尤甚，且有果皮粗硬，果肉、果皮之顏色變淡等現象。因處理 GA，在樹上着色作用進行較慢之果實亦得在60天之貯藏期間中進行着色，因此應市時果實之着色程度不致發生問題。

使用38年生普通溫州蜜柑品種「杉山」之另一試驗中，於11月4日處理GA(2.5, 5, 10, 25 或 50ppm)，兩種植物生長抑制劑 BCB 及 CCC（濃度各爲75，150 或 300ppm）於亞主枝。果實於12月13日收穫。高濃度之 GA 處理抑制果實之葉綠素消失而拖延着色。囊皮之硬化現象與宮川早生所得之結果一致。浮皮防止效果自最稀薄之 2.5ppm 區即可看出，5ppm 區之果實已在觸感上與對照區之果實有甚顯著之差異。浮皮防止效果以着色初期處理者最適當，愈晚處理效果愈劣。BCB 處理可使果皮柔軟，亦有相當程度之浮皮防止效果。CCC 處理區之效果不顯著，似乎需要自處理時期及濃度加以檢討。GA 處理使翌年春季發生之新枝葉發育良好，對開花與着果均有良好之影響。

著者等認爲 GA 之實用濃度爲5～10ppm，在此範圍，對果實之着色延遲，內容形質等變化之影響不大，藥斑之發生亦幾乎不見。早期應市爲目的之柑園，GA 處理宜在浮皮現象未發生前，着色作用已進行至某些程度時施行。至於貯藏爲目的之柑園，果實着色初期處理，即可得良好效果。（洪祖仁）

五、玉米之營養生理學研究(第一報)同化產物之生成與養份吸收之研究 〔石塚喜明、金雄桂 (1967) 日本土壤肥料學雜誌38 (11)：407～412〕

作物生育經過之進展可由生育相之展開與乾物重之增加兩方面觀察。本試驗供試之玉米品種係晚生種耐到伏性甚大者。在1965年間於北海道大學園場栽培，行距75公分株距35公分，10公畝個體數有4650株，草高在發芽後40天時開始迅速增高，在吐糸期爲最高，主稈葉數15張，雄穗抽出期在播種後83日故平均出葉間隔 5.2 日，乾物重量之變化以器官別視之，黃熟期過後葉部重量稍趨降低，莖部稍增，此時

期乾物重量之增加以雌穗部之增加爲主，其最高値是 6.6g/個體/日。總重量而言 9.2g/個體/日相當於 43g/m²/日。

營養生長期間有九張葉子從下位起順次形成，主要是第一至第四葉發揮其機能，生殖生長時期則能觀察第十至十五位葉之生長及雄穗、雌穗之分化生長，同時看出莖重之增加。由三要素吸收經過觀之在黃熟期達到最高吸收量，鉀素在此時期以後急速降低。若第四葉當營養生長時之代表葉第十二葉當生殖生長葉來計算三要素由葉片對他部份移運率結果，生殖生長葉中三要素移運率較營養生長葉爲高，尤以氮素爲明顯，進入生殖生長期以後之乾物產量特高。

玉米作物營養生長期與生殖生長期之區別不甚明確之故具有子實用與乾燥飼料併用之性格。（吳啓東）

六、乾田直播情形下水稻之出芽 II

〔太田勝一，安江多輔（1966）岐阜大學農學部研究報告22：1—9〕

爲探討水稻在乾田直播時之覆土條件與鞘葉、本葉之伸長，出芽等之關係，使用恆溫箱在 30°C 保溫下經調查結果，自播種至 6 日後若在 8 公分深水中不覆土情形下鞘葉異常伸長，約達 6 公分。

隨覆土厚度之增加幼芽之伸長顯然被抑制，此結果證實乾田直播後遇降雨致使深水狀態下所見出芽障害之一例。

以同一土壤水分下（80%）改變覆土厚度處理，例如 5 或 7 公分覆土下在小麥可見鞘葉及本葉一擠伸長到4～5公分處，本葉之伸長力亦强，但水稻在覆土深處鞘葉與本葉分離而出芽力較微弱之原因下播種後第五日尚未出芽。

覆土厚度 5 公分下設置不同土壤水分含量處理時，隨之改換土壤硬度，其影響出芽之因素較複雜，播種至 6 日後期間之觀察結果過乾之50%及過濕之 125%水分處理兩區雖未出芽，但前者鞘葉與本葉在覆土中伸長，後者未見本葉之伸長，只有鞘葉在覆土中伸長到 4 公分處。水分含量80%及95%兩區之出芽情形良好，此兩區之本葉在覆土 4 公分處開始伸長。

（吳啓東）

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